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BUREAU OF HYGIENE AND TROPICAL DISEASES.

TROPICAL DISEASES BULLETIN.

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SUMMARY OF RECENT ABSTRACTS.*

IX. LEPROSY.

Epidemiology.

In reporting two cases of leprosy diagnosed in England, HABER (p. 1041) makes the point that the disease is not notifiable and that the patients cannot legally be isolated. He thinks that the law should be revised in this respect.

In discussing a case of leprosy in the United States, in which diagnosis had been missed for some time, PARK *et al.* (p. 493) draw attention to the possibility that members of the forces who have served abroad may be infected. The disease should therefore be borne in mind by those called upon to attend returned soldiers.

SOLSONA CONILLERA (p. 493) gives an account of leprosy in Spanish Morocco since the first case was found in 1929.

SAUNDERS (p. 49) reviews the incidence of leprosy in the Virgin Islands during the last 100 years. There has been a decrease, especially since 1900, which is probably due to improvement in social and economic conditions and to isolation of patients, which is now fairly complete. In a more detailed study, SAUNDERS and GUINTO (p. 49) show that incidence in St. Thomas has been very much less than in St. Croix, and they attribute this to the higher standard of living in the former. Leprosy is most common in the lower economic groups, and house contact is an important factor. SAUNDERS and GIFFEN (p. 50) found tuberculoid changes in a high proportion of early neural lesions in the Virgin Islands. They note that spontaneous cure has taken place in several mild neural cases.

In Hyderabad, where the purdah system is practised, the known incidence of leprosy in males is much higher than in females (RAO, p. 1041). SANTRA (p. 1042) reports a high leprosy rate in Bihar, with a fairly even sex distribution but not a high child rate. He (p. 1043) has also made leprosy surveys in part of the Bombay Presidency. In this area there is a local custom of isolating leprosy patients in separate rooms of their homes, or outside the villages, whatever the type of disease. This custom may facilitate the isolation of all infective persons.

COCHRANE (pp. 47, 1042) once more points out the great importance of house contact in the spread of leprosy; in the part of India investigated, 70 per cent.

*The information from which this series of summaries has been compiled is given in the abstracts which have appeared in the *Tropical Diseases Bulletin*, 1944, v. 41. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

of diseased children were found to have been in contact with infective persons. There is some indication that in villages in which night segregation of infective persons is practised, the incidence of new cases is relatively low. COCHRANE and RAJAGOPALAN (p. 491) have carried out an investigation to determine the relative importance of contact and hereditary susceptibility in leprosy. They found that the incidence of the disease in children living in contact with infective persons not of the same family was quite as high as that in children exposed to infective members of their families, and conclude, therefore, that the importance of familial susceptibility is not so great as some authorities suggest. The authors also show that the rate of infection in exposed children is extremely high. In a survey of the work done by the B.E.L.R.A. organization in Madras, AUSTIN (p. 490) makes the point that in one group of child contacts of open cases, only 37·3 per cent. of the children showed no sign of the disease; some of these may develop lesions later. Voluntary night segregation in the villages is being tried at one rural investigation centre. WALLACE (p. 1044) also stresses the importance of preventing infection in childhood.

DOULL *et al.* (p. 48) calculate that the incidence of leprosy in persons living in household contact with infective persons is six times as high as in those not known to have been so exposed; the rate is even higher if the infective person has cutaneous lesions, but is lower with neural leprosy. From their work in the Philippines the authors think that males are inherently more prone than females to infection. The commonest age at which leprosy occurs is 10–14 years.

IBARRA PEREZ and GONZALEZ PRENDES (p. 760) calculate that more than half the leprosy patients in Havana have been infected before the age of 20, mostly in the second decade. Somewhat similar figures are quoted from other parts of the world.

In a lecture on the epidemiology of child leprosy, COCHRANE (p. 579) in addition to the points made above, lays emphasis on the frequency with which early and limited neural lesions in children undergo spontaneous recovery. He also suggests that leprosy bacilli may remain latent for years after gaining access to children, and that active lesions may develop years later when, for some reason, conditions become favourable for multiplication of the organisms.

STEINBERG and MENGONI (p. 295) have found little evidence of family contact from a study of the case histories of a series of patients, but point out that in one patient who denied any contact, a family investigation revealed several cases of demonstrable leprosy. [The implication appears to be that families should be closely investigated whatever the statements of patients may be.]

MARIANO (p. 1044) has made a study of marital leprosy at a colony in Brazil.

SANTRA (p. 1043) investigated two areas in the Central Provinces of India; in one the diet and standards of life are poor, in the other these factors are much better, yet the incidence of leprosy is considerably higher in the latter area. Here the disease is probably increasing, and the proportion of cases in children is higher than in the less affected area. The index of child cases is probably a measure of the tendency towards increase.

Writing of leprosy in West China, CRAWFORD (p. 1041) notes that climatic conditions and diet have little influence on incidence. The disease is largely rural in distribution. DAVEY and ROSS (p. 587) in Nigeria have failed to find that a diet containing large amounts of coco-yam has any effect in predisposing to leprosy. The view that the sapotoxin of this food had that effect was propounded by OBERDÖRFFER; it has similarly been disproved for India by LOWE and CHATTERJI. In an Editorial on diet and susceptibility to leprosy the author (p. 492) sums up the evidence bearing on the subject. This indicates that malnutrition and under-nutrition do predispose to leprosy, but the evidence is not conclusive and further work is needed.

Aetiology.

In a review of attempts to infect hamsters with material from human leprosy lesions, BURNET (p. 1050) points out that infection is not easy. Such material frequently contains other acid-fast bacteria, either tubercle bacilli or saprophytic organisms, and he states that because these fallacies have not been excluded, the experimental production of human leprosy in animals has not yet been proved to have taken place.

LOVING (p. 580) has cultivated an acid-fast organism from human lepromatous material, and from organs of rabbits after implantation of similar material subcutaneously, on a culture medium to which thiamin had been added. Details of this medium are given. The organism was apparently identical with the chromogenic acid-fast bacillus isolated by Duval.

MOM (p. 582) has investigated the relation between the diffusion factor of Reynals and the bacilli of leprosy. The subject is complicated and the results not consistent, but the evidence suggests that *Myco. leprae* has an inhibitory effect upon the diffusion factor. This diffusion (or spreading) factor is present in extracts of animal tissues, for instance the skin.

VEGAS and ESPIN (p. 581) give details of a method of staining *Myco. leprae* in tissues. This cannot further be abstracted.

Pathology and Clinical Findings.

GONZALEZ GUZMAN (p. 404) gives the results of a study of the leucocytes in leprosy. There was some tendency towards leucopenia, and some deviation of the Arneth Index to the left. DE CAIRES (p. 495) has found low haemoglobin levels in leprosy patients in British Guiana, not due to septic complications or to hookworm infestation. He has given iron preparations, in addition to the routine hydnocarpus treatment, with beneficial results in these cases.

DUBOIS (p. 494) records three cases in which lepromatous lesions developed in patients with leprosy of the neural type; this is an unusual course of events.

Bone changes are common in neural leprosy, but comparatively rare in lepromatous disease. FAGET and MAYORAL (p. 583) think that these changes are not directly due to the leprosy bacillus, but are secondary to neurotrophic lesions. There is absorption of bone, which generally starts in the distal phalanges and may affect the metacarpals. Trauma is a contributing factor, but the main cause is long-standing leprous neuritis resulting in disturbance of the nutritional functions of the nerves. There may be leprous endarteritis in advanced cases or in mixed leprosy, and in the few bone changes seen in lepromatous cases it is thought that the enlargement of the nutritive canals observed may be the result of this endarteritis. Bone cysts may arise from direct infection of the medullary cavity by *Myco. leprae*. COONEY and CROSBY (p. 584) also discuss the question of bone changes, and they attribute bone absorption to the combined action of disturbance of circulation, anaesthesia and pressure.

GARZON and PITT (p. 135) discuss the pathology of caseating abscesses of the nerves in tuberculoid leprosy. These are found in cutaneous branches rather than in main trunks, and pathologically the lesions resemble those of tuberculosis. Treatment is surgical.

BOSQ (p. 405) reports that he has found leprosy bacilli in macrophages and scales of the superficial layers of the skin. This epidermal elimination evidently needs further study; it appears to be a transient phase in some patients, but more permanent in others. DE SOUZA-ARAUJO (p. 220) describes a method of taking cutaneous lymph for examination in leprosy, and refers to the diagnostic and prognostic value of the method.

PARDO-CASTELLO and TIANT (pp. 135, 585) have used a modification of the histamine skin test for the diagnosis of leprosy. Intradermally injected histamine fails to provoke erythema in the skin if the sensory fibres of the peripheral nerves which supply the skin are destroyed, but in sensory paralysis due to lesions of the spinal cord, the reaction is normal.

BARROS DE SÁ (p. 403) has found that there is too much variation in the results of the blood sedimentation test, in different patients, for it to be useful in diagnosis, but he states that a study of the test for each individual patient may have considerable value in enabling an assessment of the progress of the disease to be made.

The question of positive serological reactions for syphilis in the course of leprosy is still a matter of debate. Some authorities consider that a positive test constitutes an indication for antisyphilitic treatment, though most agree that positive reactions do occur in leprosy in the absence of syphilitic infection. FAGET and ROSS (p. 1046) have examined 695 patients with the Kolmer or Kahn test, or, usually, both. The proportions positive are much higher in lepromatous and mixed than in tuberculoid and neural cases, and observation has shown that the tests tend to become negative as the leprosy progresses towards inactivity or arrest, and *vice versa*. This suggests an antibody in leprosy capable of giving these positive reactions in the absence of syphilis. The authors, therefore, do not regard positive reactions in leprosy as indication for antisyphilitic treatment in the absence of symptoms of syphilis. In a small investigation, on the other hand, WINDSOR-MCLEAN (p. 585) has found no evidence that active leprosy tends to produce a positive reaction to the Kline test.

SOTO (p. 405) discusses the eye complications of leprosy, and (p. 406) the methods of treatment that may be used for the different lesions. FIOL and ZAMBRANO (p. 406) have used thiamin hydrochloride injections in certain eye complications of leprosy ; they claim that it has some value.

KEAN and CHILDRESS (p. 50) state that in only 15 of 82 leprosy patients who died could death be attributed primarily to leprosy ; tuberculosis, heart disease, cancer and other conditions were responsible for death in the other cases. MARIANO (p. 221) claims that the notion that cancer is rare in leprosy patients is wrong, and quotes cases in support of his view. [See also KEAN and CHILDRESS, above.]

FAGET (p. 296) gives information on the chronicity of leprosy in the patients at Carville, especially in those with the neural type.

GAY PRIETO (p. 586) reports spontaneous cure in a case of leprosy.

Tests.

DHARMENDRA and JAIKARIA (p. 50) have carried out tests with various fractions derived from leprosy bacilli, to find which gives the fewest reactions in non-infected persons. The nucleoprotein extracted by the phosphate-buffer method, in doses up to 0·002 mgm., was the most favourable in this respect, and in that dosage gives positive results in most cases of neural leprosy.

In previous work it has been shown that only the protein fraction of *Myco. leprae* is antigenic in the sense of producing the lepromin reaction. By further work, DHARMENDRA (p. 584) has succeeded in isolating three different proteins, all of which produce reactions (similar to the tuberculin reaction) on intradermal injection in leprosy of the neural type. All, however, give a high proportion of reactions in persons not exposed to leprosy, though such non-specific reactions are least with the alcohol-soluble protein. Though a specific test for leprosy infection has not yet been evolved, this result encourages further work. The same author (p. 585) has now prepared a standardized antigen from whole

bacilli derived from leprous nodules. This produces both early and late reactions in neural leprosy, and retains most of the advantages of the protein fractions of the bacilli. It does not produce either early or late reactions in lepromatous leprosy. It is more refined than ordinary lepromin, and the early reactions are stronger, and the late reactions weaker, than with lepromin.

DHARMENDRA (p. 1050) has been unable to confirm the finding of BERNY and MAUZÉ that an antigen prepared from the urine of bacteriologically positive cases of leprosy is capable of giving positive skin reactions on intradermal injection into persons with leprosy, and negative results in persons not infected.

FIELDING and COCHRANE (p. 1048) suggest that lepromin should be standardized by counting the leprosy bacilli in the preparations used, and make suggestions on suitable techniques.

FIELDING (p. 1049) has investigated the action of various lepromins when injected into rats and other animals. The original paper should be consulted for details and for the results of the tests.

In a preliminary report, BASOMBRIO *et al.* (p. 404) produce evidence which indicates that reactions similar to those provoked by injection of whole lepromin, can be induced by 2–4 dinitrochlorobenzene. A later report (p. 1049) gives details of a considerable number of leprosy patients and contacts tested. In these a very large measure of agreement was found in the reactions to these two totally different substances, which brings up the whole subject of the mechanism of the lepromin reaction. BASOMBRIO and MOM (p. 1050) record a curious reaction, in three stages, resulting from the injection of dinitrochlorobenzene in a healthy person.

Treatment.

FAGET *et al.* (p. 494) have published a progress report on the use of Promin in leprosy; details of dosage are given. Although as yet no case of leprosy has become arrested, the authors show that the drug inhibited the progress of the disease in a fairly high proportion of cases, most of the patients showing improvement. Another sulphonamide was also used, but Promin "seems to possess to the greatest extent," thus far observed, "some chemotherapeutic properties against leprosy." Anaemia occurs fairly often, and may need administration of iron or liver preparations, or the administration of Promin may need to be suspended.

BASOMBRIO (p. 136) gives to patients in the early lepromatous or tuberculoid stages an intensive treatment comprising large doses of the ethyl esters of chaulmoogra, 30 cc. weekly for 7–10 months, and shows that good results are obtained in this way.

FIOL and CALCAGNO (p. 406) have found some value in a preparation of chaulmoogra and thymol. DHARMENDRA and SANTRA (p. 1045) have found that 1 per cent. of thymol is effective in place of creosote as an antiseptic in hydnocarpus oil and its esters. The authors give details of the preparation of iodized oil which can be given without trouble by intradermal, subcutaneous or intramuscular injection. The iodine appears to have some antiseptic action.

BOSE (p. 1046) has used a suspension of bismuth salt in hydnocarpus oil for the treatment of patients with both leprosy and syphilis, with some success.

Diphtheria toxoid treatment has been investigated by FAGET and JOHANSEN (p. 51) at Carville over a period of a year and with adequate controls. No evidence of benefit was found, and the results indicated that lepra reactions and neuritis were increased by the treatment. The authors conclude that this treatment is useless and may be dangerous. SCHUJMAN and MERCAU (p. 51) tried diphtheria toxoid in the treatment of 11 cases of leprosy, but found no evidence of improvement at any time during the course. IGNACIO CHALA and

Lleras Restrepo (p. 587) have added one more to the already long list of trials which have shown that diphtheria toxoid is not useful in the treatment of leprosy. Carpenter *et al.* (p. 52) have failed to find any value in rat leprosy from treatment with diphtheria toxoid. Fiol (p. 407) gives details of the treatment of leprosy carried out at a colony in Argentina. Chaulmoogra preparations are largely used ; diphtheria antitoxin has not proved useful.

For the neural symptoms of leprosy Alexander (p. 1046) gives wheat germ flour and ground nuts by mouth daily, injection of magnesium sulphate solution into or around the affected and painful nerves, or intravenous sodium bicarbonate solution for neuritis due to the lepra reaction.

Muir (p. 52) gives details for the treatment of perforating ulcer of the foot ; these should be sought in the original.

Control.

Davey (p. 53) gives an account of the Uzuakoli Nigerian Leprosy Settlement, in which much energetic work is being done. In 1942 there were 44 out-patient clinics round the central colony, and 34 model leprosy villages in being or under construction. House-to-house surveys are carried out to detect early cases for treatment, which is achieving some success, and infective persons are isolated in the villages. Money (p. 587) has given an account of two years' work in the Oji River leper settlement in Nigeria. The object of the settlement is to provide treatment to as many patients as possible, and a large number of clinics have been set up around the headquarter leprosy colony. Records of patients now number over 14,000. In the Settlement most of the patients support themselves and contribute part of their time in unpaid work, which greatly reduces the expenses.

Rat Leprosy.

Burnet and Cabasso (p. 1051) have studied the effects produced in animals by injections of oil extracts of the bacilli of rat leprosy. Those interested should consult the original abstracts.

Dharmendra and Bose (p. 588) have shown that sulphapyridine and sulphanilamide have some action in preventing infection when tissues containing rat leprosy bacilli are incubated in dilutions of the drugs at 37°C. and subsequently inoculated into rats.

Prudhomme (p. 588) has investigated the effect of injections of ascorbic acid on the course of rat leprosy ; the results were indefinite. *Charles Wilcocks.*

MALARIA.

Beet, E. A. **A Note on** *Plasmodium ovale*. *East African Med. J.* 1945, Mar., v. 22, No. 3, 85–8.

The writer of this note has found that in addition to the three well-known malarial parasites, *P. ovale* is quite common at Balovale in the Kaonde Lunda Province of Northern Rhodesia. For the benefit of those who have had little or no experience in the identification of this parasite he has described his method of staining and those features of the parasite which have proved to be of greatest assistance to him. He lays no claim to originality but expresses the hope that his account of the morphology of the parasite may help others to discover it in parts of East Africa in which its presence has not hitherto been suspected. For the identification of the parasite the author finds that thin films stained by

Leishman stain are the best. Thin films stained by Louis Jenner stain and thick films stained by Field's latest double stain have proved disappointing. In thick films it is almost impossible to distinguish the ring stages of *P. ovale*, which not infrequently have two chromatin dots, from those of *P. falciparum*. [This is quite a useful paper, which might well be read by laboratory workers concerned with the identification of malarial parasites.] *C. M. Wenyon.*

SCHÄFFER, K. *Plasmodium vivax* und die Feulgensche Nuklealreaktion. [*P. vivax* **and the Feulgen Reaction.**] *Acta Tropica.* Basle. 1945, v. 2, No. 1, 17–22, 3 figs. [10 refs.]

In 1931 PAWAN reported that he had been unable to obtain a positive Feulgen reaction in the chromatin of *Plasmodium vivax* and *P. falciparum*. In the following year BREINDL and JIROVEC reinvestigated *P. falciparum* and found that this parasite gave a positive reaction in the reproducing forms seen in capillaries of the brain. The authors of the present paper have found that the chromatin of the ring forms, schizonts and male gametocytes of *P. vivax* also give a positive Feulgen reaction. It thus appears that the nuclei of malarial parasites are in no way different from other nuclei, as the observations of PAWAN had suggested. *C. M. Wenyon.*

COOPER, T. & WESSELS, A. L. **Malaria Epidemic Aboard an LST.** *U.S. Nav. Med. Bull.* 1945, July, v. 45, No. 1, 54–66, 1 fig.

During an 8-day period, 25 members of a crew of approximately 100 on an amphibious craft fell ill with malaria. Ten days before the first cases occurred, the forward sleeping compartments were invaded by a large number of mosquitoes during beaching and unloading operations in an uncontrolled, highly malarious area. More than half the men in the first compartments forward were infected. The experience emphasizes the special risks run by landing craft, as compared with other naval vessels, and the need for good malaria discipline being enforced therein when operating in malarious areas. Protective screening and the regular use of insecticidal sprays are important. *Norman White.*

SHUTE, P. G. **An Investigation into the Number of Sporozoites found in the Salivary Glands of Anopheles Mosquitoes.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1945, July, v. 38, No. 6, 493–8.

The investigation described in this paper was undertaken with the object of determining the maximum number of malarial sporozoites in the salivary glands of infected anophelines and the number of blood meals required to deplete the glands of most of the sporozoites. Three experiments were carried out in which the infecting parasite was *P. falciparum* (Rumanian strain) and the mosquito *A. maculipennis* var. *atroparvus*. The day on which sporozoites first appeared in the salivary glands was determined by the dissection of samples from each batch. In one of the experiments this was on the 15th day and in the other two on the 11th day. Following this the batches were allowed to feed on a rabbit every second or third day. In one experiment counts of sporozoites in the salivary glands of 32 mosquitoes dissected on the 4th day after gland infection gave figures varying from 219,450 to 11,450; in another, dissections carried out on 11 mosquitoes on the 8th day after gland infection gave figures varying from 209,000 to 950. Dissections carried out later showed that generally up to the 25th day the number of sporozoites per mosquito was fairly well maintained. Following this there was a decline till after about 20 blood feeds most of the sporozoites had been discharged. It seems that there is no uniformity

in the discharge of sporozoites and that in heavily infected mosquitoes a larger number of sporozoites are discharged at the earlier feeds than at those made subsequently.

In the third experiment, in which the mosquitoes were given a single feed on a case showing 5,000 gametocytes per cmm. of blood, dissections of 53 were carried out before any oöcysts had ruptured. Of these, 73 per cent. were positive, 9 showing 1,000 or more oöcysts, and 24 others 100 or more.

The technique of counting the sporozoites is fully described. Those wishing to employ the method must consult the paper for full details. The procedure is to dissect the glands into a small drop of saline, disrupt them by pressure under a cover glass, raise the cover glass and by successive washings with drops of saline contrive to take up with a 1 cc. syringe nearly, if not quite, all the sporozoites in 1 cc. of saline. The contents of the syringe are discharged into a watch-glass and a speck of fresh finger blood is added. The whole is thoroughly mixed by suction in and out of the syringe. By means of a specially graduated capillary pipette, 0·05 cc. of the suspension is transferred to a half-inch square cover glass on which it is evenly spread. It is allowed to dry and is then stained by Giemsa stain. By means of an Ehrlich eye-piece the number of sporozoites in three rows across the cover glass are counted. This is facilitated by the presence of the red blood corpuscles. Having determined the number of rows on a cover glass the total number of sporozoites in the original suspension can be calculated. *C. M. Wenyon.*

RAEVSKY, G. E. [**Epidemiological Interpretation of Curves relating to Fluctuation in the Density of the Mosquito Population.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1944, v. 13, No. 5, 55–61, 10 figs. [In Russian.]

The author criticizes the methods used for estimating the numerical fluctuation in the population of malaria-carrying mosquitoes in a given locality (*e.g.*, Missiroli's method), as these methods do not take into consideration certain factors which affect the correctness of the results. He himself adopts and advocates the following method for collecting material for curves illustrating the density of the mosquito population: first, a census is made in a given village of all buildings capable of sheltering mosquitoes; then, three times a month, mass collections are made of mosquitoes found in buildings of diverse types. These mass catches give an idea of the numbers of mosquitoes and their distribution throughout the entire village. Their distribution in various parts of the settlement can also be established by catching mosquitoes in a "cutting" running through the entire village. In such a survey it is usually found that, while the periphery is densely populated with mosquitoes, in the centre their number is considerably lower or they may be absent altogether. The data obtained in this way are said to be free of unaccounted factors found in calculations made by other methods.

The figures obtained in these catches can serve various purposes: they indicate the mean number of mosquitoes per building, from which their number per household can be calculated, and these data, in their turn, provide material for a curve of the mosquito population of the whole village. Curves are also plotted for different buildings outside the village boundaries, where human beings occasionally spend the night. All these curves provide data of epidemiological importance regarding (1) the significance of various areas of the locality as sources of malarial infection; (2) the degree of contact between mosquito and man; (3) the most suitable period for initiating anti-mosquito measures and drug-prophylaxis of the inhabitants.

It is noted that the two sides of a curve illustrating the seasonal fluctuation in the number of mosquitoes are not equivalent. The left side applies to females

that had hibernated and to mosquitoes of the first spring generation, the former usually being of no significance as malaria vectors, while the latter become important only after the appearance in them of ripe sporozoites. This side of the curve, therefore, refers to the pre-epidemic period, providing indications for the commencement of mass prophylactic measures. The right side of the curve refers to sexually active females and to those in the diapause (or stage of dormancy). Its interpretation depends on the bionomics of the particular species of mosquito dealt with. The full epidemiological significance of the seasonal curves can thus only be realized if allowance is made for the foregoing factors. After the necessary amendments for the different species have been made, a combined curve can be plotted, reflecting the fluctuation in the populations of all the anopheline vectors present in a given locality. This curve provides the data for an analysis of the correlation between the incidence of malaria and the numbers of the vector, while the component curves for the separate species of *Anopheles* will help to outline a rational plan for an anti-malarial campaign at different periods of the pre-epidemic and epidemic periods.

The points discussed in this paper are illustrated by examples from the bionomics of some common anopheline species and by a number of curves based on actual surveys. *C. A. Hoare.*

Enikolopov, S. K. [**Biology of** *Anopheles algeriensis* **Theo.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1944, v. 13, No. 3, 68–9. [In Russian.]

The author summarizes his observations on the biology of *Anopheles algeriensis* on the inundated islands of Sulak [N.-E. Caucasus]. This is an exophilous species, entering human dwellings only for feeding purposes and flying out during the same night. It is highly susceptible to a fall in humidity, the females becoming depressed at temperatures above 25°C. and at humidity below 70 per cent. Under experimental conditions the mean duration of life of *A. algeriensis* is 6·3 days, as compared with 13·2 in *A. maculipennis* under the same conditions. On account of this, *A. algeriensis* does not live long enough in houses for the malaria sporozoites to complete their development, while under natural conditions the temperature is too low for rapid sporogony. This mosquito cannot, therefore, be regarded as an effective vector of malaria. Furthermore, this species does not disperse further than 1·5 kilometres beyond its breeding places. *A. algeriensis* flies against the wind, attracted by the smell of its prey, which is represented by various wild animals, with the exception of reptiles and amphibia. Among the characteristic features of the biotopes of the larvae are the low temperature of the spring waters (about 5°C.) and dense rushes growing on peaty soil. The cycle of development of the larvae takes 22–23 days and is independent of fluctuations in the temperature of the air. *C. A. Hoare.*

Clavero, G. & Olavarria, J. Nota sobre el hallazgo del " Anopheles algeriensis " Theobald 1903 en Escombreras (Murcia). Coexistencia de las variedades " Atroparvus " y " Labranchiae " en dicha localidad. [**The Discovery of** *A. algeriensis* **in Murcia (Spain) ; the Coexistence of** *A. maculipennis atroparvus* **and** *labranchiae* **in the same Area.**] *Rev. Sanidad e Hig. Pública.* 1944, Dec., v. 18, No. 9, 625–8, 2 figs. on 1 pl.

Torres Cañamares, F. La determinación de las especies españolas del género *Anopheles* Mg. [**Identification of** *Anopheles* **of Spain.**] *Rev. Sanidad e Hig. Pública.* 1944, Dec., v. 18, No. 9, 629–36, 5 figs. on 4 pls.

CHWATT, L. J. **Studies on the Melanic Variety of *Anopheles gambiae* in Southern Nigeria.** *J. Trop. Med. & Hyg.* 1945, Apr.–May & June–July, v. 48, Nos. 2 & 3, 22–30; 51–5. [32 refs.]

A detailed historical review is given of studies on *Anopheles gambiae* var. *melas* since its discovery by THEOBALD in 1903. In order to throw further light on the relation of this melanic form, associated in the main with salt water breeding places on the coast of West Africa, with the typical inland form of *A. gambiae*, the author carried out extensive breeding experiments in which the distribution of the morphological characters used to differentiate these forms was observed in closely related generations. The morphological characters in the adults of the two forms are very variable, even between parents and offspring, and are not related with the salinity of the breeding medium. The larval characters (structure of pecten) differentiating the two forms are confirmed, but intermediate forms occur. The separation of eggs into "type" and "melas" forms is also confirmed, though certain *A. gambiae* females may lay eggs of both forms and there is no constant association between the structure of the egg and the melanic characters of parents or offspring. There is no evidence of any difference in man-biting or malaria-carrying capacity between the two forms. The author therefore concludes that the *melas* form constitutes a "biological race" differing from the type form mainly in its ecological preferences, physiological adaptation to breeding in salt water and in its present geographical distribution, and that the present taxonomic rank of *A. gambiae* var. *melas* be provisionally retained. *V. B. Wigglesworth.*

ROBERTSON, J. D. **Notes on the Gametocyte Threshold for Infection of *Anopheles gambiae* Giles, 1902, and *Anopheles melas* Theobald, 1903, in West Africa.** *Ann. Trop. Med. & Parasit.* 1945, May 31, v. 39, No. 1, 8–10.

Anopheles gambiae takes on an average about two cubic millimetres of blood at a full meal. By comparing the ratio of leucocytes to crescents in the blood of native West African gametocyte-carriers, and then allowing *A. gambiae* and *A. melas* to feed on them, the author found that twelve females out of thirteen were infected with *Plasmodium falciparum* when the ratio was 35/1; 26 out of 46 were infected with ratios between 363/1 and 650/1; only one out of 13 was infected at the ratio of 1,468/1. The number of oöcysts found, as a percentage of the theoretical maximum based on the number present in the blood meal, varied from 1·5 to 16·0. *V. B. Wigglesworth.*

ECKSTEIN, A. Malaria in Kindesalter. [**Malaria in Childhood.**] *Schweiz. med. Woch.* 1944, Sept. 2, v. 74, No. 35, 934–9.

This is an address on the various clinical pictures presented by malaria in children, based on the author's seven years' work in Turkey as a specialist in children's diseases. During this time he has treated many thousands of cases of malaria in children and has formed the opinion that the younger the child is, the less does the clinical picture resemble textbook descriptions.

After discussing personal and large-scale prophylaxis and the special difficulties of the former in the case of young children, the author gives an account of the various clinical forms, which is similar to the contents of two previous papers [this *Bulletin*, 1943, v. 40, 516 and 517].

In the last part of the essay he discusses the connexion of noma with malaria. He saw 156 cases of noma in seven years and 91 per cent. had also malaria; that this was not merely a coincidence is shown by the fact that the malaria cases formed only 3·4 per cent. of the 123,000 cases in children attending the

polyclinic. He regards noma as the toxic form of ulcerative stomatitis, malaria and streptococcal infection preparing the ground for spirochaetes and spirilla.

In conclusion the author emphasizes the need for close collaboration between specialists in children's diseases and malaria specialists. *J. F. Corson.*

BOGEN, E. **Buffer Precipitation Test for Malaria.** *U.S. Nav. Med. Bull.* 1945, July, v. 45, No. 1, 47–53.

The buffer precipitation test used by the author is based on an observation made by E. K. WOLFF (1939), that normal human blood serum added to distilled water at *p*H 7·7 remains clear, but that blood serum from malaria patients becomes cloudy [this *Bulletin*, 1940, v. 37, 57].

Small test tubes such as are used for the Kahn Test are employed. Into one, 1 cc. of Test Buffer Solution A is placed ; this solution is made by adding one part of a stock buffer solution with a *p*H of 7·7 to four parts of distilled water and then adding 0·2 per cent. formalin as a preservative. A second tube contains 1 cc. of Control Solution B, consisting of one part of stock buffer solution *p*H 7, four parts of distilled water and five parts of isotonic sodium chloride solution with 0·2 per cent. formalin. Two drops of the clear serum to be tested are placed in each tube. The tubes are then well shaken and left at room temperature for from half to two hours when the reaction is read. The tubes are compared ; greater turbidity in Solution A as compared with Control Solution B indicates a positive reaction.

More than 3,000 such tests have confirmed the validity of the reaction. The reaction is strongest in active malaria between paroxysms and in recently recovered patients but it remains positive for many months. The test helps both in individual diagnosis and in the detection of malaria in large groups. It might help in prognosis, in guiding suppressive and therapeutic measures, and in evaluating cures. It might also be of assistance in epidemiological studies, by measuring the incidence of malaria infection in a community.

Norman White.

KHAN, N. U. **Cerebral Malaria.** *J. Roy. Army Med. Corps.* 1945, June, v. 84, No. 6, 263–7.

During the latter half of 1943, 22,041 patients suffering from malaria were admitted to the Indian wing of a combined Indian General Hospital situated in a highly malarious area. Of these 38 per cent. had *P. falciparum* infections, 61·8 per cent. *P. vivax* and 0·2 per cent. *P. malariae*. There were 67 deaths, all occurring among the 936 patients admitted to the " seriously ill " ward. Sixty of these fatalities were due to cerebral malaria.

The diagnosis of cerebral malaria is not always easy. Of the 936 patients in the seriously ill ward, 30 gave repeatedly negative blood slides : six of them died, and in all six sporulating forms of malaria parasites were found in the brain capillaries post mortem. In most of the seriously ill patients, however, blood examination revealed heavy infections. In suspected cases of cerebral malaria the immediate routine measures adopted were : blood film examination ; catheterization and examination of urine ; lumbar puncture ; the intravenous injection of six grains of quinine. The cerebrospinal fluid was under tension in most cerebral cases and the blood sedimentation rate was usually increased.

Conditions of work in a busy hospital did not permit any exact assessment of the relative efficacy of the various treatments adopted. These were : (1) quinine bihydrochloride 6 grains every 6 hours intravenously ; (2) quinine bihydrochloride by intravenous slow drip saline method ; (3) quinine bihydrochloride 6 grains every 6 hours intravenously, with 20 c.c. of 50 per cent.

glucose and 5 per cent. saline solution intravenously ; (4) methyl-sulphonate-mepacrine 0·25 gm. intramuscularly every 6 hours ; (5) the last treatment, supplemented by 20 c.c. of 50 per cent. glucose and 5 per cent. saline solution intravenously. The fear of intravenous quinine medication is considered to be quite unfounded ; in this hospital more than 10,000 such injections were given in a year with no ill effect.

The author is very favourably impressed by the results obtained by intramuscular injections of methyl-sulphonate-mepacrine, especially in advanced stages of cerebral malaria and in collapsed, debilitated or anaemic patients. Of 85 patients with cerebral malaria so treated only four died.

Patients with cerebral malaria must be carefully watched and nursed. Regular nasal feeds may be required. Unconscious patients may choke themselves with their tongues.

The post-mortem findings in 60 cases are summarized. *Norman White.*

INHELDER, H. E. Akute Malaria tertiana unter dem Bilde einer Cholecystitis. [**Acute Malaria with the Clinical Picture of Cholecystitis.**] *Schweiz. med. Woch.* 1944, Nov. 11, v. 74, No. 45, 1177–8. [12 refs.]

TOOMEY, A. G. G. **The Parenteral Administration of Quinine and Mepacrine.** *J. Roy. Nav. Med. Serv.* 1945, Jan., v. 31, No. 1, 29–32.

In treating cases of malaria in which parenteral administration of drugs is indicated the author has had such satisfactory results with intramuscular medication that he has never had occasion to resort to intravenous injections. In the series of cases reported, 44 patients had quinine bihydrochloride, and 26 mepacrine methyl-sulphonate by intramuscular injection. The doses employed were 20 grains of quinine and 0·3 gm. of mepacrine. In no case was there abscess or ulcer formation. All injections were made into the gluteous maximus. As regards effectiveness, there is little to choose between the two drugs ; quinine causes much more pain. The author describes his technique in detail. He believes that abscess formation following intramuscular injection is in all cases due to faulty aseptic technique. *Norman White.*

DREW, W. R. M. & REID, J. **Prolonged Administration of Mepacrine : its Effects on Health.** *Lancet.* 1945, July 28, 107–8.

One hundred and two soldiers who had been in West Africa for periods ranging from 8 to 36 months and had been taking mepacrine, 0·1 gm. six days a week for from 4 to 18 months, were examined on their return to England to determine whether their sojourn in the tropics and, more especially, their dosing with mepacrine, had produced any serious impairment of health. In addition to a complete clinical examination, liver function was assessed by the hippuric acid synthesis test. If the test showed any abnormality, or if there was hepatic or splenic enlargement, estimations of serum bilirubin, plasma protein and serum phosphatase, and the sucrose test were carried out. Eighty-four of the men had suffered from *P. falciparum* malaria but, owing probably to the action of mepacrine, none had suffered from the grave forms of the disease.

The hippuric acid synthesis test was abnormal in nine men, in two of them markedly so. This was of doubtful significance for on the following day other liver function tests carried out on these men gave results all within normal limits. Four months later normal values were obtained by the hippuric acid synthesis test in 7 of 8 of these men.

Ten men who had been taking mepacrine regularly for from 6 to 17 months—seven of whom had slight enlargement of liver or spleen or an abnormal hippuric

acid synthesis test—volunteered for liver puncture biopsy. No ill effects resulted from the liver punctures. The liver structure showed no abnormality except the presence of haemozoin pigment in reticulo-endothelial cells, and slight excess of iron.

It is concluded that residence of from 8 to 36 months in West Africa need not in itself cause any serious impairment of health. There is no evidence that mepacrine in suppressive doses, taken for from 4 to 18 months, has any cumulative toxic action on the kidney, liver, or blood-forming tissues. There is good reason to believe that mepacrine can eliminate severe and fatal forms of *P. falciparum* malaria, serious complications such as blackwater fever, and chronic ill-health resulting from frequent attacks of malaria. *Norman White.*

MAEGRAITH, B. & HAVARD, R. E. **Prolonged Administration of Mepacrine: Effects on Volunteers.** *Lancet.* 1945, Aug. 4, 141–2.

This is a brief account of the findings of the late Army Malaria Research Unit on the effects of continuous administration of mepacrine for long periods; experiments were made on about 500 volunteers.

In the first experiment, in which the volunteers were 109 women undergraduates, it was found that 0·1 gm. of mepacrine daily was well tolerated over 11–12 months; the drug produced no disturbance of menstruation, pulse-rate, or weight, and no sensitivity to mepacrine developed. There were minor gastrointestinal symptoms, and yellowing occurred, primarily in pigmented areas, but there was little or no conjunctival colouring.

In the second experiment, on 73 male volunteers, some of them took 0·1 gm. of mepacrine daily, while the rest were controls and took none. The following tests were made, twice before they began to take mepacrine in the case of the test volunteers, and then on all the volunteers at intervals during the following 12 months: "qualitative urine examination; icterus index; serum bilirubin; fasting blood-sugar; sucrose tolerance; blood-urea and urea-clearance; hippuric acid synthesis; plasma protein (total protein, albumin, globulin, fibrinogen); Takata-Ara reaction; whole-blood chloride; complete haematological examination." Estimations of plasma mepacrine concentration were made at intervals. No significant changes in organ functions were observed.

To observe the effect on the haemopoietic system, 65 women and 30 men took 0·4–0·7 gm. of mepacrine hydrochloride weekly for 4–10 months, while 14 men were controls. There were no significant changes in the red-cell count, white-cell count, or sedimentation rate.

The plasma mepacrine concentration reached a steady level after 5–6 weeks and remained steady (as did also the whole-blood mepacrine concentration) for as long as 15 months; in persons taking 0·1 gm. daily it was about 25 microgrammes per litre, which is above the amount considered adequate to suppress the symptoms of malaria.

The authors conclude that "suppressive dosage of mepacrine is both safe and effective." *J. F. Corson.*

HUDSON, E. H. **Quinine and Atabrine: Development and Present Application.** *U.S. Nav. Med. Bull.* 1945, July, v. 45, No. 1, 57–70, 1 fig.

YUDKIN, J. **Simple Methods for the Estimation of Mepacrine in Urine.** *J. Trop. Med. & Hyg.* 1945, Feb.–Mar., v. 48, No. 1, 1–8.

Method I.—Into a test tube, graduated at 5 and at 20 ml., pour 5 ml. of urine. Add a small amount (approx. 0·1 ml.) of powdered sodium carbonate. Add chloroform to the 20 ml. mark. Shake for one minute. Allow to stand for a few

seconds. Remove the upper urine layer with a pipette, and discard. Filter the chloroform layer into a new tube. With a little scoop, which holds 0·1 ml., take this volume of silica gel powder and add it to the chloroform extract. Shake for half a minute, or until the chloroform is quite colourless, the colour being taken up by the silica. Filter through a fresh paper. Then open the paper, allow to dry and match the colour of the silica powder (now pale yellow) against a set of standards prepared by estimating known concentrations of mepacrine. By this technique it is possible to estimate a concentration as low as 0·1 mgm. per litre ; to measure lower concentrations repeated 5 ml. samples of urine are extracted by the same sample of chloroform until a measurable colour is obtained.

Method II.—Into a test tube, marked at 10 ml., pour urine up to this mark. With a scoop which delivers the appropriate amount, add 0·25 ml. of silica gel. Shake frequently for 8 minutes, and then stand for two minutes. Pour off all the urine, and add 5 ml. of water ; shake and stand for 1–2 minutes. Add 1–2 ml. of water, and with it wash the silica gel into a folded filter paper. When the water has drained away, place the filter paper on a fresh piece of paper and open it. With a knife, scrape the silica gel off on to a third piece of paper, and allow it to dry. Then scrape it into a small heap and compare the pale yellow colour of the silica gel with standard cards prepared to match the different concentrations of mepacrine. This method will measure concentrations as low as 0·5 mgm. per litre ; silica gel is not suitable for urines which contain bile pigments.

Method III.—Use is made of paper containing 20–40 per cent. silica gel. Samples of this were prepared by Messrs Cross & Bevan. Pour 5–10 ml. of urine into a test tube. Put in a strip of the paper and allow to stand for two hours shaking every 15 minutes. Remove the paper, and dry it by pressing between two filter papers. Then compare it with standards. This method is less sensitive than the others ; it is effective in the range 1 to 10 mgm. per litre.

The silica gel powder is the kind supplied in granules for dehydration purposes. A sample with very white granules should be used. The granules should pass a 60 mesh but not a 120 mesh. Suitable powder can be obtained from Messrs Silica Gel Ltd., Aldwych House, London, W.C.2. The scoops are made by drilling a hole into a small piece of hard wood. Coloured standards can be prepared by carrying out estimations on known concentrations of mepacrine. Standard cards may also be obtained from the Editor of the *Journal of Tropical Medicine and Hygiene*. *F. Hawking.*

War Department Technical Bulletin. Wash., D.C., 1945, July, 23 pp., 4 figs. **Data on Malaria Control.** [TB Med 182. Restricted.]

Brooke, M. M. **Effect of Dietary Changes upon Avian Malaria.** *Amer. J. Hyg.* 1945, Jan., v. 41, No. 1, 81–108, 6 figs. [20 refs.]

With the object of discovering if the course of a malarial infection is influenced by deficiencies in diet, experiments were carried out on canaries, pigeons and ducks suffering from *P. relictum*, *P. cathemerium* or *P. lophurae*. After being fed for some time on a stock diet which was shown to be adequate for the maintenance of health, certain birds in each batch were either deprived of part of their daily allowance of stock diet, so that they were undernourished, or they were given one of several experimental diets in place of the stock diet. One of the experimental diets was deficient in vitamin B_1, while the others were rich in carbohydrates and low in practically all other nutritional values as compared with the control diet. It was supposed that these deficient diets were to some extent comparable with the diet of many people in malarious regions of the southern United States and other countries. As the change over from the stock

diet to an experimental one adversely affected the appetite of the birds, it appeared evident that they suffered from undernutrition as well as from malnutrition. The birds were inoculated with large doses of malarial parasites and the effect of the resulting infection was gauged by the severity of the symptoms and the intensity of the parasitaemia determined by daily counts of the parasites, the number of days during which parasites remained in the blood and the course of the infection as revealed by graphs of the daily counts. The effect of the experimental diets on latent infections was measured by the reappearance or not of malarial parasites in the blood and the intensity of infection resulting from a reinoculation of malarial parasites.

In general, the effect of the experimental diets was to cause the birds to suffer from more severe primary attacks, to reveal a greater tendency to relapse and a reduced resistance to superinfection. There were more fatal infections among the birds on the poor diet, and the symptoms of the malarial attacks were more severe. As regards birds with latent infections, parasites reappeared in the blood only in the case of those placed on experimental diets. A group of pigeons with latent infections did not show any sign of relapse or lowered resistance to superinfection when placed on a diet deficient only in vitamin B_1. Immunity to superinfection was greatly reduced or entirely lost by over one-third of the birds with latent infection when given the experimental diets. One of the birds on the stock diet was successfully superinfected but it showed a greater resistance to this infection than did superinfected birds on experimental diets. [Compare the findings of Passmore & Sommerville in monkeys maintained on deficient diets; the results did not indicate any difference from the normal in reaction to malaria infection, see this *Bulletin*, 1941, v. 38, 646.] *C. M. Wenyon.*

Haas, V. H., Feldman, H. A. & Ewing, Frances M. **Serial Passage of *Plasmodium gallinaceum* in Chick Embryos.** *Pub. Health Rep.* Wash. 1945, May 25, v. 60, No. 21, 577–82, 1 pl.

Fertile eggs are incubated for 11–12 days; 0·1 cc. of blood containing *P. gallinaceum*, obtained from an infected chick or embryo, is injected intravenously by the technique of Eichhorn (*Science*, 1940, Sept. 13, 245). After 5–6 days, blood from the embryos is examined. Suitably infected embryos are selected and their blood is collected with an anticoagulant, for infection of more embryos. The strain has now been maintained for 14 passages. During the first 12 passages 751 embryos were inoculated; 41 were sacrificed for examination, 281 (39 per cent.) died in the first 48 hours, presumably from the trauma of inoculation, 145 died at the ninth day, only 19 survived to hatch out and the remainder died at intermediate times. By the eighth day 80–90 per cent. of the erythrocytes contain parasites. Infected embryos develop a green discoloration of the membranes, amniotic fluid, yolk, liver and spleen; it begins about the 4th day and becomes heavy after the 6th day. This green discoloration is diagnostic of malarial infection. *F. Hawking.*

i. Coatney, G. R., Cooper, W. C. & Miles, V. I. **Studies on *Plasmodium gallinaceum* Brumpt. I. The Incidence and Course of the Infection in Young Chicks Resulting from Single Mosquito Bites.** *Amer. J. Hyg.* 1945, Jan., v. 41, No. 1, 109–18. [16 refs.]

ii. ——, —— & Trembley, Helen L. **Studies on *Plasmodium gallinaceum* Brumpt. II. The Incidence and Course of the Infection in Young Chicks following the Inoculation of Infected Salivary Glands.** *Ibid.* 119–22.

(i) During the course of experimental work with *P. gallinaceum* the authors had occasion to attempt infection of over 300 chicks under two weeks of age

by the bites of single infected *Aëdes aegypti*. Of these chicks, 290 survived long enough to be considered from the malarial point of view, and 248 (85·5 per cent.) became infected. The mean of the prepatent period between the mosquito bite and the appearance of parasites in the blood was 8·63±0·162 days. Of the 248 infected chicks, 84·3 per cent. died and all but one of these showed exoerythrocytic schizonts in the brain. The peak of the infection was reached within the first seven days after the first appearance of parasites in the blood. The mean of the peak parasite counts was 4,120±214 parasitized cells per 10,000 red blood corpuscles. The mean survival time of the birds that died was 13·36±0·208 days from the time of the mosquito bite. The younger the chicks the shorter was the course of the infection and the higher was the mortality rate. The authors conclude that this infection in young chicks is very suitable for chemotherapeutic studies. On the other hand they think that for inducing the infections, mechanical injection of sporozoites may be more satisfactory than the feeding of infected mosquitoes.

ii. In the second paper the authors review the results they have obtained in the inoculation of 200 chicks under a week old with the isolated salivary glands of *Aëdes aegypti* infected with *P. gallinaceum*. The infection rate of 97·5 per cent. is considerably higher than in the previous series in which chicks were exposed to the bites of single infected mosquitoes. Of the chicks that became infected 191 (97·9 per cent.) died and of 182 examined, all showed exoerythrocytic forms in the brain. The mean duration of survival of those that died was 12·05±0·163 days from the time of inoculation. The mean prepatent period was 8·523±0·108 days. The peak parasites averaged 3,776 per 10,000 red blood corpuscles. It was found that the mechanical introduction of infected salivary glands was tedious and time-consuming, though highly effective. To simplify matters injection of comminuted whole mosquitoes was tried. This was found to be so satisfactory that the procedure has been adopted as the routine method of producing infections. *C. M. Wenyon.*

Guerra, F., Beltrán, E., De la Garza, F. & Larenas, M. R. La acción del yodobismutito de sodio sobre el paludismo aviario. (*Plasmodium gallinaceum* Brumpt, 1935.) [**Action of Sodium Iodobismuthate on Bird Malaria.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1944, Mar., v. 5, No. 1, 59–66. [14 refs.]

The authors have tested the action of sodium iodobismuthate on *Plasmodium gallinaceum* infection in young chickens. In one series of ten chickens the daily injections commenced on the day parasites were inoculated (protective treatment) while in another series they were commenced on the sixth day after inoculation (curative treatment). The mortality rate in untreated infected birds was 100 per cent., the average duration of life being 19·1 days. In uninfected birds the administration of 0·03 cc. of the solution of the drug (representing 0·0022 gram) daily for six days, apart from the local irritation, gave rise to generalized toxaemia, which brought about a mortality rate of 20 per cent. during the prescribed observation period of 60 days. When 0·5 cc. of a 1 per cent. solution of quinine hydrochloride (50 mgm. per kilo. of body weight) was injected daily for the six days following inoculation, the infection was retarded while the drug was given but it developed rapidly after this, giving a mortality rate of 90 per cent. and an average life of 27·2 days. When 0·02 cc. of the solution of sodium iodobismuthate was given similarly there was a longer delay in the infection and a reduced mortality rate of 70 per cent. with an average life of 32·3 days. In the series in which treatment with sodium iodobismuthate was not commenced till the sixth day after inoculation (in this case 0·03 cc. daily for six days), though the infection was less intense than in controls which received no treatment, there was a mortality rate of 100 per

cent. with an average life of only 15·7 days, which is considerably less than in the untreated controls. It seems clear that when treatment is commenced at the time of inoculation the drug has a definite action in reducing the infection and prolonging life. *C. M. Wenyon.*

Wolfson, Fruma. **An Experimental Study of Mixed Infections with** *Plasmodium cathemerium* **and** *Plasmodium lophurae* **in Ducks.** *Amer. J. Hyg.* 1945, Jan., v. 41, No. 1, 123–35, 4 figs. [13 refs.]

Observations on human malaria have generally shown that in cases of mixed infections there is some degree of antagonism between the species of parasite present. Very little being known of the behaviour of avian malarial parasites in mixed infections, the author decided to investigate in ducks mixed infections of *P. cathemerium* and *P. lophurae*. These were produced by the intravenous inoculation of a mixture of two infected bloods in such proportion that each duck received three billion parasites of each species per kilogram of its body weight. [In American measurement, one billion is 1,000 millions.] At the same time control birds were inoculated with each species separately. A comparison of the course of the infections in the control birds with that of the mixed infections, showed that in the mixed infections each parasite developed independently of the other and that the number of parasites present at any time agreed fairly well with the sum of the numbers of parasites present in controls. Furthermore, the degree of preference of *P. cathemerium* for reticulocytes, which is a striking feature of this parasite, was the same in the birds with mixed infections as in the control birds, just as in the mixed infections the proportion of mature erythrocytes infected with *P. lophurae*, which this parasite prefers, was the same as in the controls.

Having produced the mixed infections, the author attempted to separate the parasites. It was observed that in the control birds the peak of *P. cathemerium* infection was reached on the third day, while that of *P. lophurae* infection was on the fifth day. Accordingly, subinoculations of 3 billion parasites per kilogram of body weight were made from cases of mixed infections on the third and fifth days. As was anticipated, one infection was predominantly *P. cathemerium* while the other was predominantly *P. lophurae*. The purity of these infections was then tested by inoculation into birds with latent infections of one or other of the parasites. The inoculation of the predominantly *P. cathemerium* infection into birds with a latent infection of the same species resulted in the development of a mild *P. lophurae* infection only, the birds showing a high degree of resistance to *P. cathemerium*. Similarly ducks having a latent infection of *P. lophurae* were inoculated with the predominantly *P. lophurae* infection. This resulted in what seemed to be a mild *P. cathemerium* infection. The superinfection experiments tended to indicate that the attempts to isolate pure infections from the mixed infections had, to a large extent, been successful. An outcome of these subinoculation experiments is that if subinoculations of a mixed infection of the two species is made every three days, or twice weekly, pure infections of *P. cathemerium* will ultimately be realized. It is suggested that by regulating the dose of each species inoculated it might be possible to arrange that equal numbers of each species would be present in the blood on a certain day. Such a mixed infection might be employed for testing the effect of drugs on both species in one host. *C. M. Wenyon.*

Ball, E. G., Anfinsen, C. B., Geiman, Q. M., McKee, R. W. & Ormsbee, R. A. **In Vitro Growth and Multiplication of the Malaria Parasite,** *Plasmodium knowlesi*. *Science.* 1945, May 25, 542–4.

Two techniques are described. In one, a small volume of lightly infected blood is diluted with three volumes of a very complex nutrient medium;

the container is gently rocked and a slow stream of air with 5 per cent. carbon dioxide is passed through it. In the second technique the infected blood is separated from a slow stream of nutrient medium by a cellophane membrane. In both cases, the temperature is 38·5°C. Cultivation is carried out for periods of 24 hours; if longer periods are required, subcultures are made into fresh uninfected blood and fresh medium. In 89 experiments the average multiplication of parasites during 24 hours has been three- to four-fold, which is approximately the same increase as that which occurs in the blood of monkeys. During the 24 hours, the usual periodic change in the percentages of the different stages of the parasites can be seen. Parasites have been successfully cultivated for six days, after which they were still able to infect a monkey. Various biochemical studies have been made on the metabolism of the plasmodia. One of the essential constituents of the nutrient medium is proteose-peptone; possibly it acts by supplying *p*-amino benzoic acid.

[Only a brief abstract of the provisional report of this important work has been given here, since it is hoped that a full account will soon be published.]

F. Hawking.

Venezuela. Ministerio de Sanidad y Asistencia Social. Dirección de Salubridad Pública. Division de Malariologia. Curso de Malariologia. [**Course in Malariology.**] I & II. [Cyclostyled.] 1944. Maracay, Aragua, Venezuela.

In two bound volumes the Division of Malariology of the Public Health Department of Venezuela has published the instruction papers issued to students who attended the course on malariology held at Maracay from 2nd October to 1st December, 1944. The general direction of the course was entrusted to Professor Arnaldo Gabaldon, and he was assisted by a large staff of medical men and engineers.

The papers included in these volumes are cyclostyled copies of typescript, reproduced on one side of the paper only; they form a very complete survey of the whole subject. The student who masters all this information will certainly be well able to undertake any kind of work which relates to malaria. The volumes are divided into the usual sections—protozoology, entomology, clinical matters, epidemiology, control, etc.; notable features are the instruction given in haematology, statistical methods and engineering. The whole work is, of course, written in Spanish; it provides an interesting prospectus of the instruction given, and could with advantage be consulted by those in charge of similar courses elsewhere. *Charles Wilcocks.*

TRYPANOSOMIASIS.

Burtt, E. **Hypertrophied Salivary Glands in Glossina: Evidence that *G. pallidipes* with this Abnormality is peculiarly suited to Trypanosome Infection.** *Ann. Trop. Med. & Parasit.* 1945, May 31, v. 39, No. 1, 11–13.

Hypertrophied salivary glands, brown, sack-like and coarse in texture as viewed with the low power of the microscope, and some four times the normal width, have been found in *Glossina pallidipes* and *G. morsitans*. In the former, these were found in 2–3 per cent. of flies, but in the latter, fewer than one per thousand. Among 1,129 *G. pallidipes* dissected, 32 had hypertrophied salivary glands; seven had trypanosome infections, three of these being in the group with enlarged glands. The *G. pallidipes* with hypertrophied glands thus appear particularly suited for the development of trypanosomes, notably for *T. brucei*. No evidence for this was obtained with *G. morsitans*. *V. B. Wigglesworth.*

Potts, W. H. & Vanderplank, F. L. **Mode of Entry of Contact Insecticides.** [Correspondence.] *Nature.* 1945, July 28, 112.

Tsetse (*Glossina* spp.) were allowed to settle on the dry haired surface of pieces of cattle hide which had been treated with various strengths of DDT (or pyrethrum); or the flies were held over the surface so that only their feet touched it. The drugs were applied in various adhesive solutions—gum, serum, wax, resin, &c.—and the skin dried afterwards. The flies were killed—in a few seconds by pyrethrum, and in about half an hour or more by DDT; the latter caused convulsive movements of the legs, so mechanical conveyance to the spiracles could not be excluded, but the action of pyrethrum was too rapid for this to occur. It is unlikely that any emanation could have entered the spiracles and the results suggest that the insecticides were absorbed through the cuticle of the pulvilli; in the case of DDT this would probably have great practical importance. *J. F. Corson.*

Rodhain, J. & van Goidsenhoven, C. Persistance prolongée de sensibilisatrice fixant l'alexine après guérison de la trypanosomiase. [**Persistence of Complement-fixing Antibodies after Cure of Trypanosomiasis.**] *Ann. Soc. Belge de Méd. Trop.* 1944, Dec. 31, v. 24, No. 4, 235–46.

The authors have previously recorded the presence of complement-fixing antibodies in the blood and cerebrospinal fluid of patients in the advanced stage of trypanosomiasis [this *Bulletin*, 1943, v. 40, 120]; they now present observations made on one of those patients during four years, and also some experiments on a goat and a ram, both infected with *Trypanosoma rhodesiense.*

The antigen used was made from *T. equiperdum* (occasionally, one from *T. rhodesiense* was used for comparison); a positive serum of a rabbit infected with *T. equiperdum* was used as a control in the tests.

In March 1941 the patient was clinically cured and his cerebrospinal fluid had become normal; both serum and cerebrospinal fluid, however, gave a positive complement-fixation reaction. The serum was also positive in three later tests—on 21.7.41, 10.3.42, and 1.3.43—while the cerebrospinal fluid gave a negative reaction on the two former dates and a positive one on the last, remaining normal otherwise. In May 1945 the patient was in excellent health.

The tests made on the goat and ram showed that the serum gave a positive reaction over one year after apparent clinical cure had been obtained by treatment with germanin. The cerebrospinal fluid of the goat was at first positive but quickly became negative after treatment; in the ram it was not tested.

These results differ from those of van den Branden [this *Bulletin*, 1942, v. 39, 237] who found that the serum in rabbits infected with *T. brucei* gave a negative reaction within three weeks after treatment with "moranyl" [Germanin].

The complement-fixation reaction was apparently not affected by the presence of germanin in the blood.

These observations show that the persistence of the reaction after apparent cure is not an indication for the continuation of treatment. *J. F. Corson.*

i. Chen, G., Geiling, E. M. K. & MacHatton, R. M. **Trypanocidal Activity and Toxicity of Antimonials.** *J. Infect. Dis.* 1945, Mar.–Apr., v. 76, No. 2, 144–51, 3 figs. [15 refs.]

ii. ——, —— & ——. **The Effect of Cysteine on the Trypanocidal Activity and Toxicity of Antimonials.** *Ibid.* 152–4.

i. The aim of this investigation was to find a simple quantitative method for the assay of trypanocidal activity of antimonials and to compare this property

as well as toxicity in the case of certain established preparations of antimony. The pentavalent compounds used were stibamine, stibenyl, neostibosan and neostam, as well as the trivalent types, tartar emetic, antimony-sodium thioglycollate, anthiomaline and fouadin. Mice were injected with 500,000 trypanosomes (*T. equiperdum*) intraperitoneally, whereby a moderate blood infection was produced 24 hours later. The aqueous solution of the drug was then injected intramuscularly to batches of ten or more mice in a single dose if tolerated, or in three divided doses on successive days if the single large dose proved too toxic. In the first method of assay, that of suppressive therapy, the trypanocidal activities of the antimonials were compared by the amount of each drug which gave rise to an increase in the survival time of treated mice equal to that of the life-span of untreated controls (generally two days). This quantity of drug was regarded as having 100 per cent. suppressive effect and was termed the standard suppressive dose. It was found that the suppressive effect of three of the trivalent compounds was the same, while the fourth, fouadin, was somewhat less active. The four pentavalent compounds showed equal activity, which was about 1/10 that of tartar emetic. In the second method of assay, in which curative therapy was employed, results were similar to those obtained by the first method. Determination of the value of the therapeutic index for each antimonial, based on the ratio of median lethal dose to median curative dose, shows that it is generally higher for the pentavalent compounds, while that for tartar emetic was lowest of all.

ii. VOEGTLIN and co-workers [this *Bulletin*, 1924, v. 21, 414] found that certain substances containing the SH group were able to counteract the toxic effect produced by arsenoxide on trypanosomes and a representative mammal. LAUNOY (*C. R. Acad. Sci.*, 1934, v. 199, 646) showed that cysteine also reduced the toxicity of antimony thiomalate for mice. In view of these findings the present authors have sought information on the mechanism of action of antimonials on protozoa, along similar lines. They investigated the effect of cysteine on the trypanocidal activity and toxicity of tri- and pentavalent antimonials. These substances, for which the median lethal dose, standard suppressive dose and median curative dose had been determined in mice infected with *T. equiperdum* (see preceding abstract) were injected intramuscularly. A solution of cysteine hydrochloride, previously neutralized with tri-sodium phosphate, was injected into a different muscle. It was found that the toxicity of the four trivalent antimonials used above was reduced to a marked degree, while that of stibenyl, stibamine and neostibosan was unaffected. Analogous experiments showed that the trypanocidal power of the trivalent compounds, but not that of pentavalent derivatives, was also reduced by cysteine. The authors believe, as previously suggested for trivalent arsenicals, that combination of the drug with sulphydryl groups may take place. Cysteine was also found to antagonize the inhibition of glucose breakdown by trypanosomes *in vitro*.

J. D. Fulton.

BESSEMANS, A. & DEROM, R., with the assistance of P. DOUSSY, Mlle. H. BAERT & J. STEYAERT. Trypanosomes et pénicilline. [**Trypanosomes and Penicillin.**] *Ann. Soc. Belge de Méd. Trop.* 1944, Dec. 31, v. 24, No. 4, 181–4. [10 refs.]

The authors tested the action of sodium penicillin on *Trypanosoma congolense*, *in vitro* and *in vivo*. They incubated mixtures of equal parts of heavily infected defibrinated guineapig blood and various concentrations (0·1, 1, 10, 100, and 1,000 Oxford units per cc. in normal saline) of sodium penicillin at 37°C. During the first hour, the 1,000-unit mixture alone showed more immobilization and

lysis of trypanosomes than the control, but after one hour both the test and the control tubes showed equal numbers of living trypanosomes.

The mixtures of blood and penicillin were injected subcutaneously into guineapigs ; all died of trypanosomiasis except those which received the 1,000-unit mixtures after three hours' incubation ; these were not infected.

Infected mice and guineapigs were injected intramuscularly every three hours with sodium penicillin (200 and 1,000 units) ; the mice were given these injections for 11½ days and showed no ill effects, but the guineapigs all died between the 3rd and 6th days, while control infected guineapigs only died of their trypanosomal infection. Two uninfected guineapigs also died on the 4th day of the same course of penicillin injections. No effect of penicillin on the numbers of trypanosomes in the peripheral blood was observed either in mice or guineapigs.

The authors observe that while rabbits tolerate intramuscular injections of 5,000 units of sodium penicillin given 3-hourly for 8 and 19 days, and mice tolerate 200 units 3-hourly for 8 and 11½ days, guineapigs cannot tolerate a corresponding dosage. *J. F. Corson.*

VAN DEN BERGHE, L. La trypanosomose de poussins éclos après inoculation chorio-allantoïdienne. [**Trypanosomiasis in Chicks hatched after Inoculation into the Chorio-Allantoic Membrane.**] *Ann. Soc. Belge de Méd. Trop.* 1943, June 30, v. 23, No. 2, 113–39, 1 graph & 2 figs. on 1 pl.

It is known that while adult fowls are highly resistant to infection with pathogenic mammalian trypanosomes, it is comparatively easy to infect chick embryos, which rapidly succumb to the infection.

In the present paper the author records experiments which throw light on the mechanism determining the susceptibility of the fowl at different stages of its development. In the course of this investigation about 200 chick embryos were inoculated, in the chorio-allantoic membrane, with *Trypanosoma evansi*. It was demonstrated that the chick embryo is highly susceptible to infection between the 8th and 14th days of incubation, whereas inoculations made between the 15th and 17th days fail to produce an infection. In positive cases the trypanosomes make their appearance in the blood of the embryo on the 4th day after inoculation, after which they increase in numbers up to the 7th day, eventually killing the embryo by the 8th or 9th day. Thus, as a rule, infected embryos perish before they can hatch. The author attempted to retard the course of infection in the embryo, with a view to bringing about the hatching of infected chicks. He succeeded in three cases, in all of which the embryos had been inoculated on the 10th day of incubation, while the appearance of trypanosomes was deferred to the 7th or 8th day after inoculation. In the chicks the trypanosomes persisted for a short time only, gradually decreasing in numbers and disappearing entirely six to nine days after hatching. The chick thus rapidly becomes resistant to trypanosome infection.

In vitro tests showed that the serum of normal fowls and of fowls reared from infected chicks was markedly trypanocidal, whereas the effect upon trypanosomes of serum taken from chick embryos was only slight, or was absent altogether. The age-difference in the resistance to trypanosome infection manifested by chicks appears to be similar to that observed in rats infected with *T. lewisi* : while young rats rapidly succumb to the infection, in adult rats the trypanosomes are gradually eliminated, owing to the development of specific ablastic and trypanolytic antibodies, the former inhibiting reproduction of the parasites, the latter subsequently destroying them. *C. A. Hoare.*

RODHAIN, J. & VAN DEN BERGHE, L. Inoculations de spirochètes et de protozoaires sur membrane chorio-allantoïdienne de poulet. [**Inoculation of Spirochaetes and Protozoa into the Chorio-Allantoic Membrane of the Chick-Embryo.**] *Ann. Soc. Belge de Méd. Trop.* 1943, June 30, v. 23, No. 2, 141–56. [19 refs.]

Before proceeding to tell of their own experiments the authors review the results obtained by other workers in the cultivation of spirochaetes and protozoa in the chorio-allantoic membrane of the chick embryo. A list of organisms used and the results obtained up to date by various observers is adduced.

The present authors have succeeded in infecting chick-embryos with the following organisms: *Borrelia* (=*Spirochaeta*) *duttoni*, *Trichomonas foetus*, *Leishmania infantum*, *Trypanosoma cruzi*, *T. brucei*, *T. gambiense*, *T. evansi*. However, they failed to produce infections with the following: *Treponema vesiculae*, *Plasmodium gallinaceum*, *Trypanosoma vespertilionis*, *T. pipistrelli*, *T. saimiri*, *T. rotatorium*, *T. fringillae*, *T. congolense*. As a rule the eggs were inoculated on the 10th day of incubation.

It is noted that all the pathogenic forms—with the exception of *Plasmodium gallinaceum* and *Trypanosoma congolense*—were able to grow in the chick embryo, whereas all the non-pathogenic forms, without exception, failed to produce an infection. It is noteworthy that none of the organisms capable of developing in the embryo is infective to the adult fowl. The reverse is true for *Plasmodium gallinaceum*, to which the chick is highly susceptible while the embryo is refractory. The resistance of the adult fowl to infection with certain micro-organisms is attributed to immunity, which is apparently absent from the embryo but develops in the young chick after hatching. *C. A. Hoare.*

CHEN, G., GEILING, E. M. K. & MACHATTON, R. M. **Parasitemia and Length of Survival of Mice Infected with** *Trypanosoma equiperdum*. *Amer. J. Hyg.* 1945, Mar., v. 41, No. 2, 221–7, 3 figs.

The investigation forming the subject of this paper was carried out to determine the relationship between parasitaemia, survival time and the inoculating dose of *Trypanosoma equiperdum* in mice. Each experimental mouse was inoculated with 0·5 cc. of saline-glucose suspension containing a measured number of trypanosomes, counted in a haemocytometer. This is a highly technical statistical study which should be consulted in the original. The results are summarized as follows:—

"The individual variation in the survival time of mice infected with *Trypanosoma equiperdum* was found to be independent of the inoculating dose of trypanosomes. The length of survival and the logarithm of inoculating dose as well as the logarithm of parasitemia and the duration of infection are linearly related. Empirical formulae were derived from which the survival time or degree of parasitemia may be calculated from the inoculating dose of trypanosomes."

C. A. Hoare.

ELKELES, G. **Experimental Studies and Critical Considerations regarding the Life Cycle of** *Trypanosoma cruzi*. *Amer. J. Trop. Med.* 1945, Mar., v. 25, No. 2, 141–3. [10 refs.]

This is a critical consideration of the life-cycle of *Trypanosoma cruzi*, in which the author finds himself at variance with some of the generally accepted views, according to which the development of *T. cruzi* proceeds as follows. In the vertebrate host the blood-form is represented by the characteristic trypanosome stage, which does not multiply in the blood but from time to time the trypanosomes penetrate into various tissues (especially muscle fibres) where they

become rounded into leishmanial forms. These reproduce by repeated binary fission, finally giving rise to flagellated forms of the crithidial type, which are transformed into trypanosomes again. These flagellates reappear in the blood stream as slender trypanosomes which gradually become broader, assuming the typical structure of the " adult " blood form. When taken up by the invertebrate host the blood-trypanosomes are transformed into crithidia which multiply in the gut and finally give rise to metacyclic trypanosomes. These constitute the infective stage and are voided with the faeces of the bug. When inoculated into the vertebrate host the metacyclic trypanosomes do not directly invade the blood but first multiply in cells of the reticulo-endothelial system as leishmanial forms and later develop into the slender trypanosomes which find their way into the blood.

The author doubts whether the slender trypanosomes [which he erroneously calls " metacyclic "] are transformed into the " adult " blood trypanosomes. From a study of artificial cultures he believes that the trypanosome form originates " from a direct unrolling from the round [leishmanial] form without other intermediate flagellate pre-stages." He even denies the existence of a crithidial stage in the development of *T. cruzi* in the vertebrate host, though admitting that the trypanosomes may sometimes originate from crithidia " if the latter has previously undergone a ripening process, generally combined with a multiple segmentation of the nuclei. However, this is by no means the only or most frequent mechanism in the evolution of the trypanosome form. Processes, as yet not fully explained, lead to the formation of ' microleishmania ' and ' elementary nuclei pairs ' which in turn develop directly into the trypanosome." As to the transformation of the trypanosome stage to the leishmanial stage, this is termed " retrogression " and is said to lead " to the minute round form which possibly represents a resting stage." The author also believes in the existence of sexual processes in *T. cruzi*.

[From the quotations given above it is evident that the opinions expressed in this paper are very unorthodox and conflict with the views held by most competent students of *T. cruzi*. They are, moreover, highly speculative, while the arguments adduced in their support are unconvincing and sometimes even incomprehensible. Furthermore, the author's methods of observation are also open to criticism. Thus, his views regarding the developmental stages of *T. cruzi* in the vertebrate host are based on a study of artificial cultures. In these, as is known, the development of trypanosomes is similar to that in the vector and is, therefore, not comparable to the stages observed in the vertebrate host.]

C. A. Hoare.

Romaña, C. Infección por Schizotrypanum de murciélagos argentinos. [**Infection of Argentine Bats with** *Schizotrypanum.*] *An. Inst. Med. Regional.* Tucumán. 1944, Sept., v. 1, No. 1, 93–104, 4 figs.

Trypanosomes infecting Chiroptera are of particular interest because of their strong morphological resemblance to the *T. cruzi* of man. The author has examined 331 specimens of bat belonging to 12 species [but in four species only were more than ten examined] and his findings were as follows : Of 186 *Tadarida brasiliensis* four were found infected, all in the same dwelling but caught at different times ; of 44 *Desmodus rotundus rotundus* none ; of 47 *Myotis nigricans* none ; of 15 *Histiotus laephotis* two ; of 5 *Eptesicus furinalis* three. None of the other seven species, *Eumops perotis, Promops ancilla, Cynomops cerastes, Molossops temminckii, Molossus rufus, Dasypterus ega argentinus* and *Lasiurus borealis varius*, was found positive.

Histiotus laephotis has previously been found infected, by Mazza in 1940 [this *Bulletin*, 1941, v. 38, 315], but the other two have not. Xenodiagnostic and

inoculation tests were tried but with uniformly negative results. From a study of the measurements and morphological characters of the trypanosomes seen they belong to the type *vespertilionis*. [This is one of the four types into which E. DIAS has divided the group *Schizotrypanum*, the others being *S. phylostome*, *S. hastatus* and *S. cruzi* (see TORANZOS, L. B., below). Further study is needed to determine whether or not they are the same as *T. cruzi*].

H. Harold Scott.

TORANZOS, L. B. La infestación del *Triatoma* (*Eutriatoma*) *rubrovaria* por el *Schizotrypanum cruzi*—su comprobación en la República Argentina. [**Infection of *Triatoma rubrovaria* by *T. cruzi*.**] *An. Inst. Med. Regional.* Tucumán. 1944, Sept., v. 1, No. 1, 105–16, 4 figs.

Finding Triatomidae infected with *T. cruzi* is always a pointer to the probability of Chagas's disease in man in the district. In Mercedes, a department of the province of Corientes, specimens of *T. rubrovaria* have been captured harbouring a trypanosome. For relegating these to a group DIAS has made measurements and decided that the ratio of the distance between the middle of the nucleus and the posterior extremity to that between the same spot and the anterior extremity, is of great value. This ratio he calls the Dias-Freitas Index and by its means he has named four types of *Schizotrypanum*, namely : *S. vespertilionis* with index 2·6μ, *S. cruzi* 1·6μ, *S. phylostome* 1·4μ, and *S. hastatus* 1·0μ. That found in *Triatoma rubrovaria* has an index 1·8μ, approximating, that is, to *T. cruzi*. It is easily cultivable on N.N.N. medium, is virulent for the white mouse, the guineapig, the dog and *Ctenomys tucumanus*, a rodent of the cane-fields and numerous in parts of the Argentine.

Of 202 specimens of *T. rubrovaria*, ten (4·9 per cent.) were positive. It lives in quarries and, according to the quarrymen, it is very voracious, biting day and night, especially in summer. Female Triatoma are more often infected than are males. Of 33 females examined three were positive ; of 75 males none, but of 30 in the nymph stage ten were positive.

H. Harold Scott.

ROMAÑA, C. & COSSIO, F. Formas cronicas cardiacas de la enfermedad de Chagas. [**Chronic Cardiac Conditions in Chagas's Disease.**] *An. Inst. Med. Regional.* Tucumán. 1944, Sept., v. 1, No. 1, 9–91, 50 figs. [28 refs.]

This is the first issue of a new publication from the University of Tucumán, the aim of which is to report the results of investigations into the " regional pathology and experimental medicine connected therewith and social hygiene."

The opening paper is a dissertation on cardiac conditions in Chagas's disease, based on 35 detailed cases selected from 100 under the authors' observation. They have met with a surprisingly large number of cases of heart lesions, associated with *T. cruzi* in Brazil and the Argentine—patients with subjective symptoms, palpitation, fatigue, praecordial pain and distress, even actual angina pectoris, vertigo and syncopal attacks, and objectively affections of conductibility, excitable action, extrasystoles, tachycardia, fibrillation, etc. Laboratory diagnosis by means of animal inoculation with the blood of suspects, fixation of complement with cultures of *T. cruzi* as antigen, intradermal reactions with the culture, and xenodiagnosis are spoken of.

The authors proceed to describe 35 cases in detail, with electrocardiograms of each, X-ray pictures and line-drawings of the cardiac enlargements in several. In nine of the 26 in which xenodiagnosis was attempted the result was positive ; in twelve the intradermal reaction was positive. Five of the 35 died suddenly, probably from myocarditis and heart failure ; another died but nothing is known of the mode of death in this case.

H. Harold Scott.

Martins, A., Versiani, V. & Tupínambá, A. Estudos sobre a Tripanosomiase americana em Minas Gerais, Brasil. [**American Trypanosomiasis in Minas Geraes.**] *Mem. Inst. Oswaldo Cruz.* 1940, July–Sept., v. 35, No. 2, 285–301, 4 graphs & 1 pl. (map).

Pinto, C. Tripanosomiasis Cruzi (Doença de Carlos Chagas) no Rio Grande do Sul, Brasil. [**Chagas's Disease in Rio Grande do Sul, Brazil.**] *Mem. Inst. Oswaldo Cruz.* 1942, v. 37, No. 4, 443–537, 123 figs. on 57 pls. [Bibliography.]

Dias, E. & Torrico M., R. A. Estudos preliminares sobre a doença de Chagas na Bolivia. [**Preliminary Studies on Chagas's Disease in Bolivia.**] *Mem. Inst. Oswaldo Cruz.* 1943, v. 38, No. 2, 165–72, 1 pl.

LEISHMANIASIS.

Scovel, F. G. **Kala Azar : a Review of its Incidence and Epidemiology in China and Clinical Observations on 585 Cases.** Reprinted from *Ann. Intern. Med.* 1944, Oct., v. 21, No. 4, 607–27, 2 figs. (1 map). [49 refs.]

This article is a good general account of kala azar in China based on published books and papers (49 references are given) and the author's own experience of 585 cases while superintendent of the Bachman Hunter Memorial Hospital, Tsining, Shantung. It was submitted for publication in 1941 but its appearance was delayed because of the author's protracted internment by the Japanese. Since his release the article has been brought up to date by reference to more recent work on the method of transmission and on the occurrence of the disease in the province of Shensi. As regards the various features and characteristics of kala azar in China, the article, though an interesting summary of knowledge, gives no new information which has not been published in the papers quoted. It is of interest, however, to note that reference is made to published accounts of a disease which must have been kala azar in 1880 and 1888. It is also noteworthy that the author considers that the incidence of the disease has considerably increased as a result of the disturbances caused by the war. In fact it is held that kala azar owes its prevalence in N. China to the repeated catastrophes which have ravaged the country between Nanking and Peiping from time immemorial. Many Chinese assert that kala azar follows in the wake of famine, flood and war. It is practically unknown in the more tranquil South.

C. M. Wenyon.

Kirk, R. **Studies in Leishmaniasis in the Anglo-Egyptian Sudan. VII. Espundia in a Monkey Infected Experimentally with Sudan Kala-Azar.** *Trans. Roy. Soc. Trop. Med. & Hyg.* 1945, July, v. 38, No. 6, 489–92, 1 fig.

Spleen puncture material from a typical case of kala azar in the Sudan was inoculated intraperitoneally to a monkey (*Cercopithecus aethiops*). The animal contracted a fatal infection. Spleen puncture material from this monkey was inoculated to a second monkey. Though infection occurred, the animal appeared to make a spontaneous recovery. On two occasions, at an interval of about a month, spleen puncture material was inoculated intraperitoneally to a third monkey. The monkey remained in good health for over a year, when it was noticed it had a small sore on its nose. During the next five weeks this sore extended under a scab till there was extensive ulceration of the nasal and oral region. In the exudate from the sore, and in excised tissue, leishmania were found. Two shallow ulcers occurred on the tail and another on the middle finger

of the right hand. In all these lesions, as also in puncture material from the spleen, leishmania were found. This is the first time that naso-oral lesions have been noted in experimentally infected monkeys in the Sudan, though many have been studied by the author and others. Occasionally lesions of this type occur in human cases of kala azar and the author has suggested that certain strains of leishmania may be more prone to give rise to them. In the present instance, however, there was no evidence that the patient from whom the strain originated had any such lesions. *C. M. Wenyon.*

Graham, J. G. & Naftalin, J. M. **A Case of Mediterranean Kala-Azar in a British Soldier.** *Glasgow Med. J.* 1945, July, v. 26, No. 1, 1–7.

The infection was contracted in Malta.

Pondé, R., Mangabeira, O., Jr. & Jansen, G. Alguns dados sobre a leishmaniose visceral americana e doença de Chagas no Nordeste Brasileiro. (Relatório de uma excursão realizada nos Estados do Ceará, Pernambuco e Baía). [**Kala Azar and Chagas's Disease in North-East Brazil.**] *Mem. Inst. Oswaldo Cruz.* 1942, v. 37, No. 3, 333–52, 5 text figs. & 12 figs. on 8 pls. English summary.

de Almeida, E. Um caso de leishmaniose visceral na Paraíba. [**A Case of Kala Azar from Paraíba.**] *Brasil-Medico.* 1945, Mar. 3 & 10, v. 59, Nos. 9 & 10, 82–3.

The first case to be reported from Paraíba.

Torres, C. M. Alterações cutâneas do cão no Kala-Azar sul-americano. [**Skin Changes in Dogs Infected with S. American Kala Azar.**] *Mem. Inst. Oswaldo Cruz.* 1941, v. 36, No. 1, 37–67, 24 figs. on 12 pls. [17 refs.] English abstract.

Chagas, A. W. Criação de flebotomos e transmissão experimental da Leishmaniose visceral americana. [**The Breeding of Sandflies and Experimental Transmission of American Visceral Leishmaniasis.**] *Mem. Inst. Oswaldo Cruz.* 1940, July–Sept., v. 35, No. 2, 327–33, 10 figs. on 5 pls.

Chung, H.-L., Wang, C. W. & Lee, C. U. **Solustibosan in the Treatment of Kala-Azar.** *Chinese Med. J.* Washington. 1944, Jan.–Mar., v. 62, No. 1, 17–25.

[See this *Bulletin*, 1943, v. 40, 229.]

Chung, H.-L. & Chow, H. K. **A New Sodium Salt of Mannite Antimonic Acid in the Treatment of Kala-Azar in Chinese Hamsters.** *Chinese Med. J.* Washington. 1944, Jan.–Mar., v. 62, No. 1, 26–31.

[See this *Bulletin*, 1943, v. 40, 229.]

Chung, H. L. **Localized Leishmaniasis of the Lymph Glands. With a note by** V. T. Lieu. *Chinese Med. J.* Washington. 1944, July–Sept., v. 62, No. 3, 284–92.

This appears to be a report of the case previously described, see this *Bulletin*, 1943, v. 40, 228.

War Department Technical Bulletin. Wash., D.C. 1945, July, 12 pp., 3 figs. **Visceral Leishmaniasis—Kala-Azar.** [TB Med 183.]

Kojevnikov, P. V. [**Cutaneous Leishmaniasis connected with Trauma.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1944, v. 13, No. 3, 57–9. [In Russian.]

While it is known that traumatic lesions may affect the course and dissemination of cutaneous leishmaniasis, the precise relation between these conditions is not known. The author describes four cases in which it was definitely

established that oriental sore developed on the site of an existing trauma. After considering various possible explanations of this association he concludes that sandflies might have a predilection for injured surfaces of the skin. In support of this view the author mentions that in the course of experimental feeding, sandflies were seen to bite those portions of the skin which showed leishmanial infiltration, in preference to the intact skin. *C. A. Hoare.*

Berberian, D. A. **Cutaneous Leishmaniasis (Oriental Sore). V. Experimental Canine Cutaneous Leishmaniasis.** *Arch. Dermat. & Syph.* 1945, Mar., v. 51, No. 3, 193–7. [Numerous refs.]

Certain Russian observers, working in areas in which human and canine kala azar occur, have noted that the disease in dogs is frequently associated with cutaneous ulceration, and have rather suggested that purely local lesions in dogs, apart from visceral infection, did not occur. On the other hand observers in places where oriental sore alone occurs have seen cutaneous lesions in dogs and have assumed that these correspond to the localized oriental sore of human beings. With a view to throwing light on this question the author inoculated ten pups and one adult dog with cultures of *Leishmania tropica*. The material was inoculated intracutaneously into the skin of the ears or the inner surface of the thighs. In addition, some of the dogs were inoculated intraperitoneally. In all animals cutaneous lesions containing leishmania in abundance developed at one or more of the sites of inoculation. In due course, when the lesions were well developed and contained numerous leishmania, the animals were killed and careful search for leishmania in the viscera made. In no case was it possible to demonstrate a generalized infection. It seems clear, therefore, that purely local lesions caused by leishmania, and corresponding to oriental sore in man, do occur. The author, while admitting the identity of the parasites in human beings and dogs, suggests that the dog strains be named *Leishmania donovani* var. *canina* and *L. tropica* var. *canina*. [However convenient such a terminology may be, it cannot be admitted, since the varietal names proposed imply that the canine parasites actually differ from those in man. It would be just as convenient and more correct to write (human strain) and (canine strain) after each name.] *C. M. Wenyon.*

FEVERS OF THE TYPHUS GROUP.

Wolstenholme, B. & Gear, J. **The Serological Diagnosis of Typhus Fever in South Africa.** *South African Med. J.* 1945, May 26, v. 19, No. 10, 162–6.

This paper is of interest as showing the help that laboratory workers can expect to obtain from some of the newer methods of serological diagnosis of the louse-borne, flea-borne, and tick-borne typhus fevers.

The authors classify the Weil-Felix reactions, based on the findings in several hundred cases, as follows :—

	Louse Typhus	Flea Typhus	Tick Typhus	Mite Typhus
Proteus OX19	++++	+++	++	
Proteus OX2 ...	+	+	++	
Proteus OXK ...	+	+	+	++++

The Castañeda-Silva slide-agglutination test as modified by BRUMPT [see this *Bulletin*, 1943, v. 40, 598] was found very useful as a "field" test. The "dry blood agglutination test" of STEUER [this *Bulletin*, 1942, v. 39, 372] was tried, but the results were not easy to read because of the presence of detached fragments of the dried blood.

By the complement-fixation test, tick typhus could be distinguished from louse typhus and flea typhus but in several cases of suspected tick typhus the sera were anti-complementary. This difficulty did not arise in connexion with the rickettsia-agglutination test but the preparation of suspensions of *Rickettsia rickettsi* was found so difficult that chief reliance was placed on the complement-fixation test. Details are given of the preparation of the antigens, which were obtained from yolk-sac cultures or from peritoneal washings of gerbils which had been irradiated and inoculated intraperitoneally with the three types of rickettsiae. In a table the results obtained in 20 sets of tests are shown. The six examples given below illustrate the types of response that occurred :—

Clinical Diagnosis	Slide-agglut. test	Weil-Felix Titres			Comp.-Fixn. Titres			Serological Diagnosis
		OX19	*OX2*	*OXK*	Epid.	Murine	Tick-borne	
Louse typhus	++	400	100	0	1,600	200	1·25	Louse typhus
? Louse typhus	+	50	800	50	12·5	0	50	Tick typhus
Murine typhus	++++	3,200	100	50	800	800	400	Uncertain.
Tick typhus ...	Neg.	0	50	0	12·5	12·5	200	Tick typhus
Tick typhus ...	Not done	1,600	0	0	50	50	400	Tick typhus
Murine typhus	Not done	400	50	25	100	800	0	Murine typhus

Among the 20 cases there were five in which the clinical diagnosis was murine typhus, but only one of these (the last in the above table) was confirmed by the complement-fixation test ; in the other four the result was "uncertain," in two of them because the titres with epidemic and murine antigen were the same, and in two because the epidemic titre was 1–3,200 and the murine titre was 1–1,600.

[These findings do not support the statement that "in most cases, but not in all, it is possible by this test to distinguish between epidemic typhus and murine typhus." Presumably this conclusion is based on evidence not given in the paper.]

The sera of experimentally infected guineapigs gave consistent responses ; those infected with epidemic rickettsiae reacted at titres at least four times as high with epidemic as with murine antigen, and those infected with murine rickettsiae reacted at correspondingly higher titres with murine antigen.

In all the five cases shown in the table in which the clinical diagnosis was tick-borne typhus, including one from West Africa, the titres with antigens prepared from *R. rickettsi* were at least four times as high as those obtained with epidemic or murine antigens. *John W. D. Megaw.*

PINKERTON, H. **Chemotherapeutic Studies in Rickettsial and Virus Diseases.** *Southern Med. J.* 1945, June, v. 38, No. 6, 371–3. [13 refs.]

This paper consists chiefly of a brief review of recent work on the chemotherapy of the rickettsial and virus diseases. Most of the articles quoted have been reviewed in this *Bulletin*. The mode of action of *para*-aminobenzoic acid is discussed and it is stated that some workers regard this drug as being a vitamin of the B-group. The author has found that rats deprived of riboflavine offer

poor resistance to typhus infection and that when on the point of death they are greatly benefited by this vitamin ; he suggests that *para*-aminobenzoic acid acts in the same way by stimulating cell metabolism, and that drugs with this action are likely to be of value in rickettsial diseases. He has found evidence that they may have an opposite action on diseases caused by the smaller viruses ; mice suffering from riboflavin deficiency were observed to show increased resistance to poliomyelitis infection. *John W. D. Megaw.*

Syverton, J. T. & Thomas, L. **A Method for Staining *Rickettsia orientalis* in Yolk Sac and other Smear Preparations.** *Proc. Soc. Exper. Biol. & Med.* 1945, May, v. 59, No. 1, 87–9, 1 pl.

The staining methods which give good results with the rickettsiae of epidemic and endemic typhus are less satisfactory for *R. orientalis* [*R. tsutsugamushi*] in yolk-sac preparations. The authors found that preliminary treatment with lipid solvents enabled good staining to be obtained with Giemsa's stain ; Carnoy's fixing fluid (chloroform 3, absolute ethyl alcohol 6, and glacial acetic acid 1 part) was found very satisfactory, but other mixtures of chloroform and alcohol also gave good results. Giemsa's stain was prepared by adding 1 cc. of concentrated Giemsa's stain (Grübler) and four drops of 0·5 per cent. solution of sodium bicarbonate to 39 cc. of distilled water.

Method.—The yolk-sac is washed in normal saline and smear preparations made ; the slide is immersed in Carnoy's fluid for 15–30 minutes, dried in air, and stained in Giemsa's stain for 15–30 minutes.

Results.—The rickettsiae were stained bluish-purple ; they were mostly extracellular but in some smears a few closely packed rickettsiae were seen within the cells. Smears of peritoneal fluid from mice and hamsters were also stained well by this method. *J. F. Corson.*

Monthly Bull. Ministry of Health & Emergency Pub. Health Lab. Service (directed by Med. Res. Council). 1945, June, v. 4, 122–4. **Typhus Fever.**

This note deals with the prevention of the spread of infection from cases of louse-borne typhus fever imported from Europe. Between 21st April and 28th May, 1945, 11 cases developed in prisoners of war who arrived in England from German camps during the incubation period of the disease, which may be as long as 23 days. No lice were found on the patients and no secondary cases occurred.

Between November 1944 and " occupation " 2,928 cases were reported to S.H.A.E.F. as having occurred in occupied Germany ; from that time till 4th May, 1945, there were 2,874 cases, and during the next seven days there were 1,056. Between the middle of April and the middle of May, over 83 foci of the disease were reported from the area covered by S.H.A.E.F.

The precautions needed in connexion with sporadic imported cases are described ; a summary of these is as follows :—

(1) *Expectancy.*—The possibility that attacks of fever among recent arrivals from suspected areas may be due to typhus should be borne in mind even when another diagnosis such as pneumonia seems justified. One of the diagnostic features specially mentioned is " the appearance of the characteristic macular rash *never involving the face* on the fourth or fifth day." [This statement must be read with care ; if the absence of a comma after the words in italics is not noted it might wrongly be assumed that the rash never extends to the face.]

It is pointed out that although few cases are likely to be imported, an attitude of expectancy on the part of practitioners forms the first line of defence.

(2) *Delousing.*—This will usually have been carried out before arrival in this country but in all cases of doubt it ought to be repeated. A powder containing 5 per cent. of DDT (A.L. 63, Mark III) and a suitable blower can be obtained from the P.R.M.O. of the Ministry of Health. A horticultural blower or sugar dredger can also be used. For each person an average of 1½-2 oz. of the powder is needed: this is blown inside the hat, up the sleeves (with the arms extended laterally), down the back and front of the trunk through the neck band and through the waistband all over the parts below the waist. The powder must be blown between the layers of clothing and between the inner layer and the skin so as to ensure impregnation of every part of the clothes with the dust.

If no blower is available, the clothing is removed, dusted with the powder, and placed in a pile to which several hard blows are given.

The powder will kill invading lice for 2-4 weeks, but it does not kill nits, so that 1-2 teaspoonfuls of lethane hair-oil are applied to the hair.

(3) *Immunization.*—This is specially intended for persons employed on typhus control or who are otherwise exposed to particular risk. The vaccine, with instructions for use, may be obtained from the Medical Research Council, c/o London School of Hygiene and Tropical Medicine, Keppel St., London, W.C.1., or from the Emergency Public Health Laboratories. Any reactions that occur are usually mild, especially in cases of revaccination. Immunity is fully developed in about four weeks; the vaccine does not provide a guarantee against attacks, but greatly modifies their severity. *John W. D. Megaw.*

Beach, H. L. W. & Rennie, J. K. **Four Cases of Typhus Fever in Great Britain.** *Brit. Med. J.* 1945, Aug. 4, 153–4, 1 fig.

These four cases occurred among war prisoners who had returned from a camp in Germany; they had been disinfested with DDT powder two days before reaching England, and on arrival they were found free from lice. The periods elapsing between disinfestation and onset were 7, 9, 11, and 27 days. Three of the patients had been under observation in the hospital since their return so the whole course of the illness was observed. The Weil-Felix titre rose to 1–1,000 in every case.

One of the patients, a man of 44 years, died on the 14th day; a septic finger had to be incised on the 2nd day of his illness. Two other patients had fairly mild attacks lasting about a fortnight. The fourth patient, aged 29, had an exceedingly mild attack; his temperature rose to 103·2°F. within 12 hours of the onset. It remained high for two days, then became low intermittent in type; the whole attack lasted six days and the patient's condition was excellent even while the temperature was high. No rash was seen. The onset in this case was 27 days after disinfestation; this interval was longer than the generally accepted maximum incubation period of 23 days. It was suspected that there had been contact with the patient first attacked, though no other secondary cases occurred. The Weil-Felix titre on the 2nd day was 1–50, on the 6th day it was 1–1,000.

In view of the mildness of the attack the question of previous immunization arose, but the patient did not know the nature of the last vaccine he had received, nearly two years earlier.

The clinical picture in the other three cases conformed to that of one or other of the recognized types of typhus fever except that the temperature showed a pronounced tendency to be remittent or intermittent. From the charts illustrating the paper it is seen that the temperature of one patient fell to normal on the 3rd, 4th, 9th, 10th and 13th days.

Penicillin was administered to all the patients with the object of preventing secondary infections; the dosage was 15,000 units by intramuscular injection

every three hours, but the first injection was not given before the 10th day except in the mildest case, in which it was given on the 2nd day ; the duration of the treatment is not stated and the authors disclaim any attempt to draw any conclusions on its effect.

[The source of infection in the very mild case is likely to remain an unsolved mystery, though it is possible that infected louse faeces may have been deposited on some article of the patient's clothing before disinfestation was carried out. Typhus rickettsiae are known to remain virulent for long periods in dry insect droppings and it is believed that persons who handle infected clothing may acquire the disease either by inhaling infected dust or by direct contact. Disinfestation would not prevent the occurrence of this kind of infection and some experts insist on the necessity for disinfection of the clothing and body of any person who is likely to harbour infected lice. Thorough disinfection is often impracticable in the presence of an epidemic, but it offers the only guarantee of eliminating the risk of persistent infection.] *John W. D. Megaw.*

Hussain, N. **Typhus in Kashmir.** *Indian Med. Gaz.* 1945, Mar., v. 80, No. 3, 132–3.

In the main valley of Kashmir, at altitudes ranging from 5,000 to 12,000 feet, outbreaks of typhus fever have been reported from time to time. The epidemics briefly described in the present paper occurred in the winters of 1942–43 and 1943–44. The persons chiefly affected were members of a cattle-keeping community, who spent the winter seasons in crowded insanitary conditions and who were heavily infested with lice. In 1942–43, 1,526 cases were reported, of which 408 were fatal ; in the following winter there were 946 cases with 320 deaths, mostly in one district. Probably there were many more cases.

Protective immunization by vaccine was used on a small scale, apparently with good results. *John W. D. Megaw.*

Jackson, D. S. **Typhus Fever in Gilgit.** *Indian Med. Gaz.* 1945, Apr., v. 80, No. 4, 207–8.

The author records his impressions, based on 213 cases, only five of which were fatal, treated by him in the hospital of the Agency Headquarters Station of Gilgit [altitude about 5,000 feet in Kashmir] between November 1943 and August 1944 ; 139 of the cases occurred during the four months, February June ; in August there were only four cases.

Most of the patients belonged to the poorer classes ; there was evidence of transmission from person to person ; the doctor in charge of the medical ward and two members of the hospital staff were attacked.

A typical rash appeared between the 5th and the 7th day in every case. There was delirium in 80 per cent. of the patients ; the onset of this coincided with the appearance of the rash.

The infection was [quite naturally] regarded as louse-borne.

John W. D. Megaw.

Varela, G. & Zozaya, J. Distribución en México de las cepas de tifo exantemático hasta ahora estudiadas. [**Distribution in Mexico of the Strains of Typhus so far Studied.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1945, Mar., v. 6, No. 1, 11–14, 1 fig. English summary (4 lines).

GINTSCHEFF, P. Z. Farbige Agglutination zur Schnelldiagnose des Fleckfiebers. [**Slide Agglutination of Stained *Proteus* as a Rapid Test for Typhus.**] *Zent. f. Bakt.* I. Abt. Orig. 1944, May 10, v. 151, No. 4/5, 261–3.

The rapid slide-agglutination test described by the author differs in no essential respect from the one introduced by BRUMPT in 1940 [see this *Bulletin*, 1945, v. 42, 197]. Reference is made to five slide tests but all these are of German origin.

The author attaches importance to the use of a special synthetic medium for the preparation of the *Proteus* cultures used in making the suspension, he uses a mixture of malachite green and parafuchsin for staining the bacilli, and he stores the suspensions in a patent drop-bottle. Those interested in details of the technique must consult the original article. *John W. D. Megaw.*

DONOVICK, R. & WYCKOFF, R. W. G. **The Comparative Potencies of several Typhus Vaccines.** *Pub. Health Rep.* Wash. 1945, June 1, v. 60, No. 22, 605–12.

This paper was approved for publication on October 22nd, 1942, but was withheld because of the subject matter ; it describes the results of an investigation carried out in continuation of the experiments previously reported [see this *Bulletin*, 1945, v. 42, 792]. It is now stated that the vaccine labelled IIA was treated by ether after centrifugation, and the one labelled IIIA was refined by TOPPING's method in which the crude vaccine was extracted with ether. Another series of vaccines prepared by the same methods, and labelled TIA, TIIA, and TIIIA were tested, with the same results.

Other experiments were carried out with the vaccines ; by these it was found that the complement-fixation titre in guineapigs treated by single doses of the vaccines reached its maximum in about four weeks ; and that after small single doses of weak vaccines the titre was low and soon fell to an insignificant level, whereas with potent vaccines the titre rose to a great height and took many weeks to fall below a measurable height.

Alum precipitation of the vaccines did not enhance the titre of the reaction and caused no delay in its fall. *John W. D. Megaw.*

DE VIDAS, J. **A Survey of Scrub Typhus (K Typhus) in New Guinea.** *Med. J. Australia.* 1945, June 23, v. 1, No. 25, 631–4, 6 figs.

The author's description of the clinical and pathological features of " scrub (mite-borne or K) typhus " is based on a study of 80 cases, of which 20 were fatal. [This exceptionally high fatality rate in a group of patients whose average age was 26 shows that the infection must have been very virulent. Presumably also the patients had been debilitated by hardship.]

The infected areas were patchy ; they comprised open prairies of kunai grass, rain-fores areas, untended plantations, and jungle growth. Wet humus for the larval mites, and available food for the rats, were conditions essential for the maintenance of infection in a locality.

D. C. SWAN is quoted as stating that in the Goodenough Island the mites of the scrub-typhus areas belong to different species from those in the nearby " scrub-itch " areas. The consensus of opinion was that *Trombicula fletcheri* and *Tr. walchi* transmit scrub typhus, while *Tr. mediocris*, *Schöngastia pusila*, and *Sch. blestowel* cause scrub itch.

A description is given of the clinical and pathological features of two fatal cases in which death occurred after illnesses lasting 12 and 13 days, respectively.

Among 15 cases in which a post-mortem examination was made, an eschar occurred in 11, a rash in 11, and adenopathy and splenomegaly in all. Other

features were: severe myocarditis in nine cases; less severe myocarditis in 6; bronchopneumonia in 7; cloudy swelling and congestion of the kidneys and liver in all the 15 cases; severe congestion and oedema of the lungs in 8; hydrothorax in 7; haemorrhages in the mucosa of the pelvis of the kidneys in 3; and petechial haemorrhages in the meninges in 3.

The predominant histological lesion was a perivascular infiltration by lymphocytes and histiocytes, especially in the lungs, heart, liver, kidneys, spleen and lymph glands. Swelling of the vascular endothelium with a tendency to thrombus-formation, as described by CORBETT, was not usual, though in specimens from two cases not belonging to this series vasculitis and endothelial proliferation, with thrombosis and haemorrhage, were pronounced in addition to perivasculitis; both of these patients died after an illness of about six weeks.

The author suggests that in scrub typhus the inflammatory process spreads from the outside of the vessels towards the interior, whereas in classical typhus it spreads centrifugally from the endothelium. [This view is not supported by the descriptions given by other observers of the microscopic changes in the two diseases.]

The average Weil-Felix response for *Proteus OXK* was:—a titre of 1–160 on the 10th day, rising to the maximum height by the 22nd–25th day, beginning to decline 5–7 days later, and "finally disappearing" in two months. Titres below 1–160 were not regarded as significant [but FELIX attaches great importance to low-titre reactions when an earlier test has been negative].

The author obtained good results with a rapid slide-agglutination test based on the modification of the Kudicke and Steuer test described by BARDHAN *et al.* [this *Bulletin*, 1944, v. 41, 379]. On a drop of dried blood two drops of concentrated *OXK* suspension are placed; after a minute the slide is gently rocked for 5–10 minutes. White granules appear when the reaction is positive.

John W. D. Megaw.

SINGH, G. **Report on an Epidemic of Scrub Typhus (K Form) treated at a General Hospital in Burma.** *Indian Med. Gaz.* 1945, Apr., v. 80, No. 4, 199–201.

Within 24 days, in September 1941, 107 cases of scrub typhus were seen at a general hospital in Burma; all but two of the patients belonged to one unit which was camped in a rural area. Only two of the patients died. In 88 cases there was enlargement of the lymph glands, either generalized or associated with a necrotic patch situated "on the chest or shoulders in 19, on the trunk in 11, and on other parts of the body in 8." A rash appeared between the 3rd and 5th day in 38 cases; it was macular in 30, and papular in 8. In 42 cases the leucocyte count was 9,000–13,500 per c.mm.; in 12 it was less than 5,000 per c mm.

The Weil-Felix reaction was of the *OXK* type in all cases; except for three of these in which the titre was 1–80 or 1–160 the range of the maximum titre was 1–320 to 1–10,240. In 1·6 cases *OX19*, and in all 11 cases *OX2*, were also agglutinated at titres ranging from 1–40 to 1–320.

In 10 cases there was an after-fever, regarded as a relapse; after falling to normal the temperature rose again 1–5 days later and fever of an intermittent or continued type, lasting 4–5 days, occurred.

The author makes the following statements:—"The rat flea, *X. cheopis* has been implicated in the transmission of scrub typhus, and ticks in other forms," and, "There is reason to suppose that in this outbreak of scrub typhus, the disease, normally sporadic, achieved epidemic proportions owing to the change of vector, *i.e.* conveyance by lice within a louse-infested unit."

[These statements are surprising ; perhaps the article was written before it became generally known that mite-borne typhus can occur in the form of sharp epidemics when bodies of troops enter infected areas. The reviewer's earlier classification of the typhus fevers as " epidemic " and " non-epidemic " may have been responsible for misunderstandings in this connexion ; his later classification of the fevers as " demic " and " zootic " was proposed for the purpose of avoiding ambiguity (see *Brit. Med. J.*, 1942, Oct. 10, 433). " Epidemic typhus " often occurs in endemic or sporadic form, and fevers that primarily affect lower animals may occur in epidemic form ; hence the desirability of adopting the rarely used words demic and zootic for primarily human and primarily lower animal diseases.] *John W. D. Megaw.*

MENON, M. C. & IBBOTSON, C. **Scrub Typhus : a Clinical Study.** *Brit. Med. J.* 1945, July 28, 112–14.

In the last two months of 1944 and the first month of 1945 there were 110 cases of scrub typhus among the soldiers of a British unit which had entered a small " typhus island " in North-East Burma.

The onset was usually sudden ; all the patients had severe headache with frontal or post-orbital localization ; the temperature reached its maximum within 48 hours, after which the fever was continued, though in some cases there were occasional intermissions with profuse sweating ; the termination was by lysis.

Some of the other features were as follows (the figures in brackets show percentage incidences) :—Early sore throat (54), occasionally with dysphagia (3·6) ; eschar (56), in two cases there were two eschars and in one case there were three ; conjunctival injection (82) and flushing of the face (65) appeared about the 3rd day ; a moderate degree of generalized enlargement of the lymph nodes (98) could be detected from the 4th day ; the rash (64), usually maculopapular, but occasionally purely macular, appeared on the 5th or 6th day and lasted 3–4 days, it was mainly on the trunk, face, upper arms, and thighs.

The mental changes (50) in average cases were apathy and confusion, in severe attacks there was restlessness, delirium, or a " typhoid state." Diffuse bronchitis (50), with mucoid sputum, occasionally blood-tinged, was regarded as part of the syndrome, but when the sputum was purulent or the leucocyte count over 10,000 per cmm. extraneous infection was believed to be the cause. Cyanosis was a danger signal ; hiccup (20) was distressing when it occurred, it was a feature of six of the nine fatal cases. A progressive fall in the blood pressure occurred in patients who were going downhill. Nerve deafness was common. Neck rigidity (5·4) was not associated with any change in the cerebrospinal fluid. Blood counts were seldom abnormal.

The titre of agglutination of *Proteus OXK* was less than 1–125 in 20 undoubted cases.

Bronchopneumonia or lobar pneumonia occurred in seven cases ; in three of these empyema followed in spite of treatment by sulphathiazole ; repeated aspiration, together with local and general treatment by penicillin had to be carried out ; in one of these cases penicillin failed because of a secondary infection with *Bact. coli*, and resection of a rib was needed. Other complications were :—parotitis, in one case ; femoral thrombosis, in two cases ; mild peripheral neuritis in six cases, and bedsores in three. Coexistent malaria occurred in 15 patients, two of whom had cerebral symptoms. Nine patients died, one suddenly of myocardial failure on the 4th day of convalescence, and another as a result of haematemesis ; in the latter case numerous small haemorrhages were found after death in the stomach and intestine ; the remaining seven deaths were attributed to toxaemia, they occurred between the 12th

and the 24th days. In some of the bodies subpleural haemorrhages were found.

Treatment was by an adequate diet containing at least 2,400 calories and 100 gm. first-class protein, and by combating dehydration and salt depletion ; in some cases a transnasal tube was used. Patients were kept in bed till the pulse rate became normal, usually for 10–13 days after defervescence. Hiccup responded temporarily to inhalations of CO_2 and oxygen ; cyanosis was treated by oxygen which had to be continued for three days in some cases. Malaria was so common that a therapeutic course of mepacrine was given at the onset in all cases ; this was followed by suppressive treatment. *John W. D. Megaw.*

Sather, R. O. & Silberstein, J. S. **Scrub Typhus.** *Bull. U.S. Army Med. Dept.* 1945, July, v. 4, No. 1, 68–75, 1 chart.

This paper deals with 14 sporadic cases of scrub typhus which occurred in the four months, August to November, in New Guinea. The onset was insidious with severe fronto-parietal headache ; weakness and apathy were very pronounced during the early stages. An eschar was seen in only one case. A rash was seen in four cases ; it was maculo-papular in two ; macular in one ; and scarlatiniform, on the abdomen, in one. Local or generalized lymphadenitis occurred in four cases, and four patients had subconjunctival haemorrhage. The fever was remittent in all the cases ; the temperature fell to normal, by lysis, on the 13th–15th day.

The *Proteus OXK* titre was determined on several occasions in most of the cases ; of four sera tested towards the end of the 1st week, two were negative, and the titres in the other two were 1–40 and 1–80 ; 11 sera tested towards the end of the 2nd week gave the following titres :—0 in three ; 1–40 in two ; 1–80 in four ; 1–160 in one ; and 1–320 in one. The titres in 12 cases tested from the 21st to the 25th day were :—1–40 in one ; 1–160 in four ; 1–320 in one ; and 1–640 to 1–2,560 in the rest. In one case the titre never exceeded 1–80, which was reached on the 14th day, negative reactions having occurred on the 7th and 12th days.

There were no deaths, but some of the patients " developed a picture of shock " and were treated with good results by plasma in doses of 100–200 cc.

In a description of two cases it is stated that 3,500–4,000 cc. of fluid were given daily by oral and parenteral routes.

The protean nature of the disease is stressed. *John W. D. Megaw.*

Gottfried, S. P. **A Preliminary Study of Blood Chemistry Findings in Scrub Typhus.** *Amer. J. Clin. Path.* 1945, Feb., v. 15, No. 2, 71–6. [14 refs.]

In view of the lack of information on the blood chemistry of scrub typhus the author has made this comprehensive investigation.

Between November 1943 and February 1944, 47 patients were studied, as far as possible at three stages of the disease ; these stages were : during the 1st week ; at the height of the fever ; and just after defervescence. Healthy controls who had never suffered from scrub typhus, syphilis or jaundice were investigated simultaneously. The procedures adopted are described or named. The table below has been compiled from the detailed tables contained in the paper.

Blood sugar values were practically normal. Blood urea nitrogen was high in one fatal case. The lowering of the plasma carbon dioxide in 11 patients in the 2nd stage was not regarded as important, it was attributed to tachypnoea. The fall in the plasma chlorides is an indication for chloride therapy. The low serum protein may have resulted from exhaustion and malnutrition rather than from infection, most of the patients had come from combat areas. The persistence of low serum albumin in early convalescence shows that the rise in the

	Stage I	Stage II	Stage III	Controls
Plasma carbon dioxide :				
Subnormal	0	11	1	0
Normal	16	30	33	25
Plasma chlorides :				
Subnormal	8	29	2	2
Normal or high	8	12	32	23
Serum proteins :				
Subnormal	6	18	2	2
Normal or high	10	23	32	23
Serum albumin :				
Subnormal	10	33	25	1
Normal	6	8	9	24
Albumin-Globulin ratio :				
0·5–0·9	1	4	6	0
1·0–1·4	3	21	16	0
Normal	11*	16	12	25

*Also one in which it was 3·1–3·5.

total serum proteins during the fever was due to an increase in the globulin, and this may have been associated with stimulation of the protective mechanism of the body. Plasma fibrinogen was low in 40 per cent. of the cases, but also in 20 per cent. of the normal controls, so that environmental factors must have contributed to the fall. In some cases the icterus index and the urobilinogen content were high, but the same features were found in controls who were taking atebrin. Liver-function tests with bromosulphalein gave practically norma results. Serum calcium was normal in the 20 cases in which it was estimated.

John W. D. Megaw.

Lucas, R. B. **Isolation of a Strain of *Rickettsia orientalis* from Cases of XK Typhus in Ceylon.** *Indian J. Med. Res.* 1944, Oct., v. 32, No. 2, 223–6. [13 refs.]

This paper is of special interest to workers concerned with the isolation of rickettsiae in cases of scrub typhus and other fevers of the typhus group. The author mentions the great range of variability observed in the reaction of guinea-pigs to intraperitoneal injections of blood from patients suffering from " XK typhus." With many strains of infection it has been impossible to isolate rickettsiae or even to detect any febrile reaction ; with a few strains repeated passages have been made and there has been a consistently high mortality among the guineapigs.

In the present experiments 12 guineapigs and three white rats were inoculated with pooled suspensions of blood clot from groups of patients between the 7th and 14th days of their attacks of scrub typhus. Blood from 14 patients was employed. In one of the white rats enlargement of the spleen was found after the death of the animal on the 19th day ; otherwise no significant reaction, febrile or of other type, was detected in any of the animals. Despite the absence of apparent reactions three separate series of passages through guineapigs were undertaken, pooled brain and spleen substance obtained on the 12th to the 14th day being used for each passage. The original inoculum used in the first series of passages was obtained from a guineapig inoculated with pooled clot from two patients on the 12th day ; in the other two series it was from two white rats inoculated with pooled clot from three patients on the 14th day. Brain and spleen material from the last guineapigs employed in the above

series of passages was then pooled and inoculated into two guineapigs from which, 14 days later, a pooled suspension of brain and spleen substance was prepared and injected intraperitoneally into two white mice, both of which died, one after 17 days, the other after 18 days.

Although no guineapig inoculated in the three series, each of which comprised four passages, showed any apparent reaction, the white mice developed an abundant exudate in the peritoneal cavity and smears made from this contained " numerous *R. orientalis* " located in the endothelial cells.

The infection must have been transmitted through the guineapigs and white rats in inapparent form, and " the white mouse is considered to be the experimental animal of choice for this type of work."

A suspension of blood clot from four 12th day patients was injected into the anterior chamber of the eye of four rabbits ; no reaction followed in these animals or in others inoculated in the same way with suspensions of lymph glands removed at biopsy from patients on the 24th day.

Attempts to infect the yolk sac of ten embryo chicks with blood-clot material from patients also failed. *John W. D. Megaw.*

LEWTHWAITE, R. **Scrub Typhus.** [Correspondence.] *Lancet.* 1945, June 16, 770.

Lewthwaite remarks that in one theatre of war in the Far East, scrub typhus is probably by now the only disease that kills men in more than trivial numbers. He notes that scrub-itch has rarely been seen in the troops, and has seldom, if ever, been associated with the occurrence of scrub typhus. In fact the opinion is widely held that the two conditions are caused by separate species of mites. Lewthwaite goes on to refute a statement that scrub typhus was at one time thought to be tick-borne, and to quote some of the evidence by which transmission by larval mites has been proved. *Charles Wilcocks.*

RODHAIN, J. & BARLOVATZ, A. L'histologie de l'escarre dans la fièvre pseudo-boutonneuse de la région du Maniema (Congo Belge). [**The Histology of the Eschar in the " Fièvre Pseudoboutonneuse " of the Maniema Region (Belgian Congo).**] *Ann. Soc. Belge de Méd. Trop.* 1944, June 30, v. 24, Nos. 1–2, 37–42, 4 figs. on 2 pls.

The authors describe the histology of an eschar excised from the scrotum of a patient on the 7th day of an attack of a fever called the " pseudo-boutonneuse " or " pseudo-typhus " fever of Maniema. [The latter name is unsuitable in two respects ; it suggests that the fever is the same as the " pseudo-typhus " described by SCHÜFFNER about the year 1909 and now known to be mite-borne typhus ; also, even if the fever were the same, its name ought to be translated into French as pseudo-typhoïde ; Schüffner himself translated it into English as pseudo-typhoid.]

The loss of tissue in the lesion was limited to the epidermis. The vascular and perivascular lesions in the dermis were similar to those described in the papular eruptions of typhus fever. The eschar is said to differ from that of boutonneuse fever and tsutsugamushi disease in the absence of any evidence of an infecting bite and in the restriction of the necrotic process to the epidermis and the superficial layer of the dermis. The authors state that these differences may suggest the occurrence of infection by deposition of infected material on the surface of the skin rather than by injection through a bite.

John W. D. Megaw.

HARRELL, G. T., WOLFF, W. A. & VENNING, W. **A New Approach to Basic Supportive Therapy in Rocky Mountain Spotted Fever.** *Southern Med. J.* 1945, June, v. 38, No. 6, 367–70, 1 fig.

This paper is of wider interest than the title suggests ; the general treatment of Rocky Mountain spotted fever can safely be assumed to follow the same lines as are suitable for the other typhus fevers.

The author states that the " pathologic physiology " of the disease is quite comparable with that of extensive burns ; in both of these conditions there is leakage of proteins through the walls of the blood vessels into the tissues ; treatment by salines and glucose causes a further escape of the proteins and prevents their reabsorption, with the result that oedema develops and a further fall occurs in the blood pressure. Transfusions of plasma, on the other hand, promote the reabsorption of crystalloids into the vessels. The treatment of a number of very severe cases of Rocky Mountain spotted fever was carried out in accordance with this principle ; as much as 2,500 cc. of plasma was given within 36 hours to a boy aged 15 years.

The treatment was controlled by frequent estimations of the non-protein nitrogen, the chlorides, and the total serum proteins of the blood.

The authors mention the studies of WOODWARD and BLAND in which a favourable reference is made to the use of plasma in some cases of epidemic typhus fever [this *Bulletin*, 1945, v. 42, 199].

In discussing the paper, N. H. TOPPING pointed out that the patients had come under treatment at a late stage and that some of the changes described would not have occurred if adequate fluids and a high-protein diet had been given from the onset ; he also advised great caution in carrying out the recommendations because of the danger that was involved.

John W. D. Megaw.

ANIGSTEIN, L. & BADER, M. N. **Para-Aminobenzoic Acid—its Effectiveness in Spotted Fever in Guinea Pigs.** *Science.* 1945, June 8, 591–2. Also in *Texas Reports on Biol. and Med.* 1945, v. 3, No. 2, 253-4.

Experiments are described showing the effect of PABA (para-aminobenzoic acid) on guineapigs infected with a virulent strain of Rocky Mountain spotted fever which killed 100 per cent. of untreated control animals. The guineapigs were fed *ad lib.* on a high-protein diet containing 2 gm. PABA per 1·00 gm.

The drug was started 24 hours before the infecting inoculation in 12 guinea-pigs ; seven of these remained completely afebrile, five had fever lasting 1–3 days, there were two deaths.

Among 17 guineapigs whose treatment started on the day of inoculation, 11 remained afebrile, three had fever lasting 1–2 days, two had typical fatal attacks, and one died without fever.

When the drug was given for the first time during the incubation period—in some cases as late as 72 hours after inoculation—30 per cent. of the animals remained afebrile, in spite of the fact that their appetite was capricious, so that smaller doses of the drug were taken.

The action of PABA appeared to be purely suppressive ; spleen substance of the treated animals, when inoculated into normal guineapigs, caused typical fatal attacks.

John W. D. Megaw.

BARTONELLOSIS.

SAMANIEGO, B. M. Comisión de estudios sobre bartonellosis. Pasto-Nariño-Colombia. Situación actual y programa. [**Commission for the Study of Bartonellosis. Present Position and Programme for the Future.**] *Rev. Facul. de Med.* Bogota. 1944, Nov., v. 13, No. 5, 523–30. English summary.

In 1936 a peculiar disease appeared in Southern Colombia with a high mortality rate, about 1 per cent. of the total population. Various diagnoses were proposed—typhoid fever, pernicious malaria, yellow fever, brucellosis, trypanosomiasis—before PATIÑO CAMARGO, in 1939, showed that the condition was a form of bartonellosis [*see* this *Bulletin*, 1940, v. 37, 271, 582, 583 ; 1941, v. 38, 209 ; 1943, v. 40, 904], and it was found to be more extensive than had been believed and its appearance was recorded in Ecuador, Peru, and Guatemala. The disease was originally known as Guáitara fever and the vector proved to be *Phlebotomus*. In Colombia the districts affected were the Departments of Nariño and Cauca, and mainly the valleys of the rivers Pacual, Guáitara, Juanambú, Mayo and Sambingo, tributaries of the Rio Patía.

The National Government, in 1939, instituted a campaign against bartonellosis. At first its efforts were confined to helping the victims by establishing hospitals in the chief foci ; later, attention was given to raising the standard of living of the poorer inhabitants who were the main sufferers from the disease. In successive years from 1940 to 1943 the total cases in Colombia were 571, 486, 750 and 434, with deaths numbering 142 (fatality rate 24·8 per cent.), 104 (21·4), 99 (13·2), and 24 (5·5) respectively.

The total population of the bartonellosis zones is stated to be 180,000 and the morbidity rate is very high, 24 per cent., in ordinary times, higher, of course, in epidemics. The chief causes of death are tuberculosis, malaria, typhoid and typhus fevers, malnutrition and intestinal parasitism. The author examined 100 persons [he does not say how they were chosen] and found 25 so ill that they could do no work at all, 70 in poor health, anaemic, undernourished and parasitized, but able to work ; only five out of the hundred were " enjoying good health."

The programme of the Health Authorities for the future comprises, in addition to study of the epidemiology of and research on bartonellosis, widespread antimalaria drainage, erection of large numbers of dwellings with proper and adequate sanitation, delousing to prevent the spread of typhus, and propaganda and education in health matters. *H. Harold Scott.*

KESSLER, W. R. & ZWEMER, R. L. **Studies on Experimental Bartonella Anemia in the Albino Rat. III. Potassium and other Blood Changes.** *J. Infect. Dis.* 1944, Sept.-Oct., v. 75, No. 2, 134–7, 1 fig.

" During acute infection with *Bartonella muris* in the adult rat there is a terminal increase in the plasma potassium level which occurs immediately before death. This may be a result of the red cell destruction. There is also an increase in the clotting time of blood of infected rats."

CARR, D. T. & ESSEX, H. E. **Bartonellosis : a Cause of Severe Anemia in Splenectomized Dogs.** *Proc. Soc. Exper. Biol. & Med.* 1944, Oct., v. 57, No. 1, 44–5, 1 fig.

" After splenectomy had been performed on a dog severe anemia developed and stained smears of the blood revealed organisms that had the morphologic characteristics of *Bartonella canis*. The disease was transmitted to two other dogs, confirming the diagnosis of bartonellosis."

YELLOW FEVER.

EPIDEMIOLOGICAL INFORMATION BULL. (UNRRA HEALTH DIVISION). WASHINGTON, D.C. 1945, June 15, v. 1, No. 9, 365–70. **Standards for the Manufacture and Control of Yellow Fever Vaccine.**

Certain requirements for the preparation, preservation and use of yellow fever vaccine have been adopted by the U.N.R.R.A. Expert Commission on Quarantine.

An aqueous-base (serum-free) type of vaccine is to be prepared according to methods described [this *Bulletin*, 1943, v. 40, 692; 1944, v. 41, 123]; the dried product must contain not more than 1 per cent. of moisture and it is sealed in glass ampoules filled with nitrogen. The 17D strain virus of the 200–300th subculture [*ibid.*, 1937, v. 34, 690] is used and must conform to certain requirements on testing in monkeys [*ibid.*, 1944, v. 41, 125; 1945, v. 42, 803]. In the monkey safety test on the secondary seed virus, the serum of inoculated monkeys (*Macaca mulatta*) must show a certain standard of virulence to mice, and at least five out of the six inoculated monkeys must become immune; not more than two of the six monkeys may develop encephalitis. Chick embryos from virus-inoculated eggs should preferably be not over 11 days old [*ibid.*, 1942, v. 39, 686].

The finished vaccine, when rehydrated to its original volume, shall contain not less than 150,000 M.L.D. ($L.D._{50}$ for mice); at least 500 M.L.D. should be used to vaccinate man. Random samples of the finished vaccine must be tested on guineapigs, 4–5 cc. being injected intraperitoneally; no significant clinical reaction shall occur, but if a reaction does occur in one of two guineapigs, a re-test is made on three and not more than one shall show a reaction. Random samples are also tested for sterility.

The labels shall show certain details. The "date of manufacture" is the time of passing a satisfactory potency test; the "date of issue" is when distribution begins and must not be later than one year after the date of manufacture; the "expiration date" must be not more than one year after the date of issue. Certain temperatures at which the virus must be kept are specified.

For use, the vaccine is diluted 1 : 10 in normal saline and 0·5 cc. is immediately injected subcutaneously; the dose is the same for children and adults. Other regulations relate to shipping and the official release of the vaccine.

The seed virus must be preserved in the dry state under nitrogen at −70°C. or colder. If properly prepared and stored it will remain viable for an indefinite number of years. The secondary seed virus is prepared as chicken embryo pulp similarly to the preparation of the pulp for vaccine production, and is stored in ampoules like the primary seed virus. *J. F. Corson.*

SPRAGUE, H. B. & BARNARD, J. H. **Egg Allergy; Significance in Typhus and Yellow Fever Immunization.** *U.S. Nav. Med. Bull.* 1945, July, v. 45, No. 1, 71–4.

Reactions after inoculation occurred in two men who were sensitive to egg protein; in one the inoculation was with yellow fever vaccine prepared from chick embryos, while in the other it was with typhus vaccine made by the Cox yolk-sac method.

The first patient, aged 20, was admitted to hospital for examination because he had developed severe asthma within 15 minutes after receiving the first dose of yellow fever vaccine five months before; he also showed oedema of the face and generalized urticaria at the same time.

As a child he had suffered from eczema up to 2 years of age, and from asthma up to 8 years of age; he had long been sensitive to white of egg and to various

nuts, and tests about the time of his admission showed a sensitivity to ragweed pollen, egg white, house dust, horse serum, cotton seed, cow dandruff, flax seed, chicken-meat, typhus vaccine 1 : 10, and yellow fever vaccine 1 : 10. Mouse protection tests showed that he had developed immunity to yellow fever in spite of his reaction.

The second patient, aged 23, had been vaccinated simultaneously with typhus vaccine, a " typhoid booster shot," and 0·5 cc. of tetanus toxoid. Within two hours he developed massive, generalized oedema, dyspnoea, dysphagia and coryza. Eggs had always caused angioneurotic oedema of his mouth and throat and swelling of his neck glands, and in 1935 he had had an almost fatal reaction to horse serum in tetanus antitoxin. As a child he had suffered from eczema and later from hay fever. Tests showed sensitivity to typhus vaccine, tetanus toxoid, yellow fever vaccine, egg white, horse serum, but not to triple typhoid vaccine. A year before, he had had no reaction to tetanus toxoid and yellow fever vaccine.

The authors think that such persons should be excluded from the Services.

J. F. Corson.

DENGUE.

Sabin, A. B. & Schlesinger, R. W. **Production of Immunity to Dengue with Virus modified by Propagation in Mice.** *Science.* 1945, June 22, 640–42.

Most of the interesting experiments described in this paper were carried out with an exceptionally virulent strain of dengue virus isolated during an outbreak in Hawaii. The serum of persons infected with this virus contained 1,000,000 infecting doses per cc., and by ultracentrifugation a concentrate was obtained containing 10 times this number of infecting doses. Repeated attempts to transmit the concentrated virus by passage through embryo chicks, and the first two attempts at passage through mice by intracerebral inoculation, resulted in failure, but eventually the authors succeeded in effecting a series of 16 passages, up to the date of writing, by intracerebral inoculation of 10- to 12-day-old albino Swiss mice. Only 10–20 per cent. of the originally inoculated mice showed signs of infection, and the incubation period was often 3–4 weeks, but with passage through the mice a progressively increasing number of the animals showed nervous-system manifestations and the incubation period became shorter ; it was about two weeks at the 6th passage. At the 14th passage 90 per cent. of 20 three-weeks-old mice showed signs of infection, but only one of 10 six-weeks-old mice of the same strain was affected, and very few reactions occurred among some other strains of albino Swiss mice. Cotton rats, guineapigs, hamsters, and rabbits gave no reactions to passage strains. It was found later that although unconcentrated infected serum of human origin failed to infect mice, the same serum diluted 1–100 was infective ; this suggested the presence of an " inhibitor " in the serum.

Among four strains of dengue virus isolated in New Guinea only one was capable of infecting mice, and this strain had been found by the senior author to be immunologically identical with the Hawaiian strain, whereas the other three showed some degree of immunological difference.

Small doses of suspensions of the brain and spinal cord of infected mice, up to the 6th passage, caused dengue, sometimes moderately severe, when injected into volunteers ; material from the later passages sometimes caused no fever, sometimes there was a brief febrile reaction on the 8th, 9th or 10th day ; the usual response was an extensive maculo-papular rash and the occurrence of petechiae on the feet. The senior author (unpublished) had previously

observed " an interference phenomenon between yellow fever vaccine and the regular unmodified dengue virus in human beings " so he added yellow-fever vaccine to the virus, with the interesting result that only a faint rash, and no petechiae, appeared in inoculated persons. All the nine volunteers inoculated with virus of the 7th, 9th or 10th passage became immune to dengue, as was shown by negative responses to bites by mosquitoes of proved infectivity. Volunteers inoculated with a mixture of yellow fever vaccine and dengue virus were examined later by Dr. Max THEILER and found to have neutralizing antibodies for yellow fever also.

Aëdes aegypti mosquitoes became infective after feeding on volunteers at the time of the appearance of the rash resulting from inoculation with the virus of the 7th and later passages. Large numbers of the mosquitoes had to be used and the intrinsic incubation period in the insects was prolonged to more than three weeks ; the reactions caused in persons who were bitten by these infected mosquitoes were afebrile, the evidence of infection consisted in the rash and the typical leucocyte changes.

The immunity produced by the dengue vaccine is not likely to be more lasting than that resulting from an attack of the disease, but the vaccine might be of considerable value in special circumstances.

It would perhaps be too much to expect that the modified virus would be capable of maintaining the mosquito-man-mosquito cycle for a prolonged period without loss of infectivity or increase in virulence. If this happened it would be possible to protect a community against severe outbreaks of dengue by releasing a number of mosquitoes infected with the modified virus. The enlistment of the local mosquitoes as unpaid vaccinators would be an inexpensive method of control, *if it worked*, but mosquito control, facilitated by DDT, is likely to remain the most satisfactory method of prevention.

John W. D. Megaw.

PLAGUE.

DE VILLAFANE LASTRA, T. El sulfatiazol en el tratamiento de la peste de Oriente. [**Sulphathiazole in the Treatment of Plague.**] *Rev. Asoc. Med. Argentina.* 1945, Mar. 30, v. 59, No. 554, 268–73, 3 charts. [11 refs.]

Thirty-five cases were subjected to treatment : 4 were of septicaemic and 31 of bubonic type. There were five deaths, all bubonic, and in four of these cases there was the complication of plague meningitis. The dosage of sulphathiazole was high, 10 to 12 gm. per day for adults and 5 to 7 gm. for children, administered by the mouth and maintaining a concentration in the blood of over 8 mgm. per 100 cc. for not less than six days. As auxiliary to this treatment, patients received vitamin B_1, desoxycorticosterone and normal glucose saline. It was important to keep the patient well supplied with fluid to drink.

W. F. Harvey.

CHOLERA.

PANJA, G. **Treatment of Cholera with Atebrin.** *Indian Med. Gaz.* 1945, Mar., v. 80, No. 3, 133–4.

Dyes such as brilliant green and malachite green have been found to be both bacteriostatic and bactericidal to cholera vibrios, but in practice they are rendered inactive by the alkaline contents of the intestine. This is not the

case with atebrin, which was found to be bacteriostatic in dilution of 1–4,000 to cholera vibrios of Inaba and Ogawa strains. It is not bacteriostatic, however, to paracholera or saprophytic vibrios, nor to enteric and dysentery bacilli. Experimental guineapigs, prepared for cholera infection by starvation, and administration of sodium bicarbonate, opium and atropine, were used with appropriate controls. The control animals died, while those given atebrin survived, the intragastric testing dose of *V. cholerae* being 15 cc. of young broth culture. Twenty human cases of cholera were treated with atebrin in a dose of one tablet [presumably 0·1 gm.] every 15 to 30 minutes until four to six tablets had been given on one day. Some patients received two more tablets on the following day. It was found necessary to give these patients hypertonic saline on admission, which was late in the collapsed stage. Nineteen of the twenty patients survived, which is a very satisfactory result. Eight patients treated with quinacrine, in whom the results were not so encouraging, may be taken as a control series. *W. F. Harvey.*

Sen, A. N. & Basu, U. P. **Synergistic Effect of Sulphanilyl Benzamide on *V. cholerae* Bacteriophage.** *Indian Med. Gaz.* 1945, Apr., v. 80, No. 4, 194–6.

In this investigation the bacteriostatic action of sulphanilyl benzamide (a sulphonamide derivative) has been determined, and also its influence on the lytic action of cholera bacteriophage. A stock solution of one gramme of the powder in 100 cc. water at *p*H 8·0 was used to make appropriate dilutions. In the first place it was found that the drug in limiting dilution of 1 in 20,000 exerted no action on the cholera vibrio. The second step was to determine whether this dilution could exert any bacteriostatic action on secondary growth after stock bacteriophage had destroyed a partially susceptible strain of *V. cholerae*. It is this action which is describable as synergistic. Special tests showed that the drug had no destructive action on the lytic action of the phage itself. Results obtained seem to indicate that the drug acts only on the vibrios which are not lysed by the bacteriophage. These same vibrios, however, on culture, did not differ apparently from the original strain in morphology and smoothness, nor were they acted on by the drug in the dilution used. Thus it would seem that the lytic action of the phage is synergistically increased in the presence of the drug, and that a combination of the two agencies, sulphonamide and phage, might be useful in the treatment of cholera. *W. F. Harvey.*

War Medicine, Chicago. 1945, June, v. 7, No. 6, 371–6. **Cholera.** War Department Technical Bulletin. TB Med 138.

BACILLARY DYSENTERY.

Wall, R. & Garvan, J. M. **Dysentery in the Northern Territory.** *Med. J. Australia.* 1945, Apr. 28, v. 1, No. 17, 426–9.

Bacillary dysentery due to Flexner bacilli is endemic throughout the Northern Territory of Australia; the present report relates to the treatment with sulphaguanidine of 101 acute cases and 13 carriers, the dosage being as follows:—an initial dose of 7 gm. followed by 3·5 gm. every four hours until there were less than five stools in 24 hours, then 3·5 gm. every eight hours until a normal number of stools were passed on each of two successive days, the total dose to be not less than 70 gm. In the 101 acute cases the average total dose was 104·7 gm. given in an average period of 8·1 days.

Carriers were given 3·5 gm. every four hours for three days, then every eight hours for four days, *i.e.* about 109 gm. in a week.

Five patients had a toxic rash and headache and three had slight fever; in one patient sulphonamide crystals were found in the urine.

It was found by trial that a fairly full and varied diet could be taken from the beginning without ill-effects; it included soups, porridge, sago, rice, blancmange, junket, steamed puddings (without suet), eggs, liver, brain, fish, minced meats, vegetable *purées*, tinned and stewed fruit, toast, bread, biscuits, and small amounts of butter, the fats to be kept low. No fresh milk was available. A fluid intake of 4½ litres in 24 hours was aimed at.

The only complications were transient pain and tenderness near joints, and recurrence of diarrhoea (15 cases) about a week after the end of sulphaguanidine treatment.

Stools and rectal swabs (143 of each) were examined bacteriologically at various intervals, from 5 to 30 days, after completion of the course of sulphaguanidine; no dysentery bacilli were isolated. In the 101 acute cases sigmoidoscopy showed a normal rectal mucous membrane after, on the average, eight days from the end of the sulphaguanidine course.

Prolonged observation after treatment was not possible as it was necessary to return the patients to duty as soon as possible. *J. F. Corson.*

AMOEBIASIS AND INTESTINAL PROTOZOAL INFECTIONS.

LIEBERMANN, H. R. **Carrier Rate of Intestinal Parasites in the Non-European Staff of a Military Hospital in Natal, with special reference to** *E. histolytica*. *South African Med. J.* 1945, July 14, v. 19, No. 13, 231–3.

The persons examined were mostly Africans, with a few Indians; they were employed in general work in the kitchens, wards, messes, and grounds of the hospital. A fresh preparation of faeces in saline and in iodine was examined microscopically, no concentration methods or staining being used.

Among those engaged in handling food in the main kitchen, carriers of cysts of *Entamoeba histolytica* were found, and the same result was obtained in other departments where food was handled. Ova of *Ascaris* and *Trichuris trichiura* were also present in food handlers, and in one case, *Ancylostoma*.

Thirty-one of the 105 males showed cysts of *E. histolytica* and 38 showed helminth ova—*Ascaris* (31), *Trichuris trichiura* (34), Taenia (2), and *Ancylostoma* (2). No cysts of *E. histolytica* were found in the females.

J. F. Corson.

CANAAN, T. **The Pathogenicity of the** *Amoeba hystolytica*. *J. Roy. Egyptian Med. Ass.* 1944, Oct., v. 27, No. 10, 446–57.

A thorough microscopical examination of the fresh faeces of 400 patients at a Jerusalem hospital was made to determine the incidence of infection with *Entamoeba histolytica*; 122 (30·5 per cent.) were infected. The relationship of infection to the presence of abdominal symptoms was examined in 356 of these patients; 101 had symptoms of acute intestinal inflammation, 75 had mild symptoms of indigestion, and 180 had no abdominal symptoms; *E. histolytica* was found in 27 (26·7 per cent.) of the first group, in 36 (48 per cent.) of the second, and in 40 (22·2 per cent.) of the third group.

The author concludes that in Palestine the rate of infection is about the same in persons with symptoms of acute intestinal inflammation as in persons with

no abdominal symptons. From long experience in a German hospital in Palestine he has learned that amoebic dysentery is comparatively rare among the Palestinian Arabs ; the hospital records show that there were only 11 cases of amoebic abscess of the liver among 9,690 in-patients from April 1934 to May 1939. These findings have an obvious bearing on the diagnosis and treatment of cases with intestinal symptoms. *J. F. Corson.*

Beltrán, E. Influencia del sexo en la incidencia de protozoarios intestinales humanos, especialmente *Endamoeba histolytica.* [**The Influence of Sex in Infection with Human Intestinal Protozoa, especially** *E. histolytica.*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1945, Mar., v. 6, No. 1, 31–6. [21 refs.] English summary.

" Results of investigations carried on by the author, as well as those from others, are presented in relation to any possible sex difference in parasitation for human intestinal protozoa generally, and specially by *E. histolytica.*

" Consideration of the parasitological findings in 16,435 subjects, does not seem to show any definite relation between sex and parasitation.

" Considering the possible avenues of infection, the author's opinion is that the differences found in distinct surveys are due to peculiar living conditions of the groups considered, rather than to any more or less susceptibility in one or another sex."

Hargreaves, W. H. **Chronic Amoebic Dysentery. A New Approach to Treatment.** *Lancet.* 1945, July 21, 68–72. [14 refs.]

After referring to recent papers by Adams [this *Bulletin*, 1945, v. 42, 559] and by Lamb & Royston [*ibid.* 561], and to his own contribution to the discussion on Adams's paper [*ibid.* 560], where he describes the experience now given in the present paper, the author relates the history of specific treatment of amoebiasis, concluding that no evidence exists to show that any specific drug is equal to emetine bismuth iodide (E.B.I.).

During the past year the author's standard treatment has been as follows : a 12-day course of E.B.I. together with retention enemata of chiniofon [" yatren 105," " quinoxyl "] followed by stovarsol or carbarsone, grains 4 *bis die* for 12 days ; if there were dysenteric symptoms this was preceded by six daily injections of emetine hydrochloride, grain 1.

The 21-day " blunderbuss " treatment of the Liverpool School of Tropical Medicine is as follows : on the odd-numbered days, auremetine [a combination of the periodides of emetine and auramine ($C_{17}H_{22}N_3Cl.HO$)] 1 grain *t.d.s.* ; bismuth carbonate 1 drachm *t.d.s.* ; on even days—at 8 a.m. a rectal wash-out with 2 per cent. sodium bicarbonate ; at 9 a.m., the foot of the bed being raised, a retention enema of 2 per cent. " quinoxyl " [chiniofon] by a catheter (half way through the course the strength becomes 4 per cent.) ; stovarsol tablet grains 4 *t.d.s.* ; bismuth carbonate 1 drachm *t.d.s.* The patient stays in bed on the even days and is allowed up on the odd days if well enough. A glucose drink (1 lb. of glucose to 1 quart of barley-water or lemonade, etc.) is given, and a normal diet, avoiding indigestible foods.

The author compared the two forms of treatment, each on 40 patients ; of those receiving E.B.I., six were not cured, while of those receiving the Liverpool School course, 21 were not cured. He concluded that, in spite of its unpleasant action, E.B.I. should be given daily.

The existence or development of emetine-resistant strains of *E. histolytica* has been accepted by Adams, Lourie and others, but the researches of Dobell *et al.* [this *Bulletin*, 1918, v. 12, 5] did not support that view and, in the author's opinion, there is no reliable evidence that they can be produced.

He then describes his experience of treatment of amoebic dysentery, amplifying his earlier account [*loc. cit.*] ; he treated 268 patients during the past year, about one-fifth of them having severe symptoms and some being desperately ill. Many patients from Burma had had amoebic dysentery since 1942, and most of the patients had had repeated courses of E.B.I., but it had almost always been given in a badly absorbable form such as pills or tablets ; the author points out that, in spite of repeated condemnation, E.B.I. is still made and administered in keratin-coated tablets.

These patients responded poorly to the standard treatment and the author, as previously reported [*loc. cit.*] tried penicillin and succinyl-sulphathiazole [" sulfasuxidine "] ; the former was given in a total dosage of 2 million units intramuscularly (100,000 units as the initial dose followed by 33,000 units 3-hourly), and the latter by mouth in a total dosage of 80 gm. The results were very good, apparently by action on secondary infections and not on the amoebae.

In the second week of treatment, three daily specimens of faeces were examined and sigmoidoscopy done ; if the result was satisfactory the patient was sent away for a month's convalescence, and if he kept well he was readmitted to hospital and six daily faecal examinations and a sigmoidoscopy were made. On his discharge he was given follow-up cards for reporting by post.

Notes of 10 illustrative cases are given.

Penicillin was also tried with success in five cases of chronic ulcerative colitis. *J. F. Corson.*

VAKIL, R. J. **Tolerance to Enterovioform Tablets.** *Indian Med. Gaz.* 1945, Mar., v. 80, No. 3, 147–8.

The active substance in " enterovioform " is " vioform " (iodochlorhydroxy quinoline) which has been used with success in the treatment of amoebiasis in man [this *Bulletin*, 1934, v. 31, 283]. The author records the case of a patient whose symptoms appeared to have been the result of taking enterovioform continuously for a long period.

A man, aged 35, complained of increasing lassitude and fatigue on slight exertion, headache and mental depression, which began two months before, in June 1944. On examination he showed great nervous irritability and a fine tremor of the outstretched hands ; the first heart sound was less loud than normally, the pulse rate was 116 per minute, and the blood pressure was 104/60. No other signs of disease were found.

In the middle of 1943 he was ordered to take six enterovioform tablets daily by mouth for diarrhoea or dysentery and was cured of his symptoms in a fortnight ; he chose, however, to continue taking the tablets without a break until August 1944, and had then taken 2,000 tablets.

He was treated by rest in bed, a light diet, digoxin and coramine tablets, and intravenous injections of glucose, and was cured in three weeks ; the first heart sound became normal, the pulse rate 70 per minute, and the blood pressure 132/78. *J. F. Corson.*

WAR MEDICINE, Chicago. 1945, June, v. 7, No. 6, 390–96. **Amebiasis.** War Department Technical Bulletin. TB Med 159.

WAR DEPARTMENT TECHNICAL BULLETIN. Wash., D.C. 1945, Aug. 1, 6 pp. **Water Treatment in Areas where Amebiasis and Schistosomiasis are Hazards.** [TB Med 190.]

FRASER, J. F. & TAYLOR, R. **Diarrhoea due to** *Giardia lamblia*. *Brit. Med. J.* 1945, Aug. 11, 184–5.

Among 872 cases of diarrhoeal diseases treated in a British general hospital in India, *Giardia intestinalis* was the sole apparent cause in 21 and was present also in four cases of bacillary dysentery and in four of amoebic dysentery. All the 21 patients had diarrhoea and 15 complained of colic, which was relieved by evacuation of the bowels; tenesmus was present in one case only. In nearly all, the stools were watery faecal, rather paler than normal, and generally appeared greasy; in two cases blood and mucus were present. The duration of symptoms before admission to hospital varied from 1 to 35 days, but in most cases it was a few days only. Treatment with mepacrine—0·1 gm. t.d.s. for five days—cured all except two and a second course cured these. All the patients were given a generous diet and symptoms disappeared by the third day of treatment. *J. F. Corson.*

HEMMING, G. R. **Giardiasis associated with Recurrent Rectal Haemorrhages.** [Memoranda.] *Brit. Med. J.* 1945, Aug. 11, 185.

A female child, aged four years, was admitted to hospital at Suva, Fiji, on March 13, 1944, with a history of fever, constipation, weakness, and passage of blood with the stools. Physical examination revealed no abnormality, but she continued to pass blood until her discharge to the out-patient department on May 6. The blood passed was sometimes clotted, sometimes bright red, and mucus was often present. The stools were soft and pale and there was often diarrhoea. No parasites were found in the faeces and sigmoidoscopy showed no abnormality. Her blood contained 3,100,000 erythrocytes per cmm. and haemoglobin 80 per cent.

She was readmitted with the same symptoms six days later; examination of the stools on various dates showed infestation with *Trichuris* and hookworm and, on May 27, a heavy infestation with *Giardia intestinalis*. On June 1 her blood showed 2,800,000 erythrocytes and haemoglobin 60 per cent. Treatment was given for the anaemia, and mepacrine, 3/4 grain t.d.s. for five days, was given for the giardiasis and was repeated after 10 days; no blood appeared in the stools after the first course of mepacrine and the patient was discharged on June 22. *J. F. Corson.*

SEGAL, M. **Giardiasis: Report of a Case.** *South African Med. J.* 1945, June 23, v. 19, No. 12, 213.

Cysts of *Giardia intestinalis* were present in the faeces of a male child, aged 16 months, who had been suffering from diarrhoea for a month. On admission to hospital he was much wasted; the stools were bulky, loose, clay-coloured and foul-smelling—"exactly similar to those seen in coeliac disease." The urine was normal. The temperature was 100°F.

A fat-free diet was ordered to be given, at first cautiously, then, as the child was ravenously hungry, more liberally. "Elixir Bevitin" and sulphaguanidine were also prescribed. Improvement was prompt and rapid and the child left hospital after six days and had remained well when seen again a fortnight later.

When the laboratory report of the presence of cysts of *Giardia intestinalis* was received, the sulphaguanidine was replaced by atebrin (as "Quinacrine") which was given for five days, but as marked improvement had already taken place it is doubtful if this had any effect. *J. F. Corson.*

RELAPSING FEVER AND OTHER SPIROCHAETOSES.

ANDREEV, L. A. [**Tick-borne Relapsing Fever in Kazakhstan.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1944, v. 13, No. 3, 53–7. [In Russian.]

Although the presence of tick-borne relapsing fever in Kazakhstan [Central Asia] has been suspected for some time, there have been no records of its incidence or of the occurrence of the tick-vector in this region. The author reports the results of a survey carried out by the local Tropical Institute in 1940 with the object of throwing light on the distribution of this disease in Kazakhstan. It was shown that the distribution of the vector, *Ornithodorus papillipes*, was restricted to the basin of the river Chirchik in the Bostandyk district, in which a number of villages proved to be foci of relapsing fever. *C. A. Hoare.*

i. HEILMAN, F. R., with the technical assistance of Mary KNUTSON & Nellie GREENBURG. **Streptomycin in the Treatment of Experimental Relapsing Fever and Leptospirosis Icterohaemorrhagica (Weil's Disease).** *Proc. Staff Meetings Mayo Clinic.* 1945, May 30, v. 20, No. 11, 169–76. [27 refs.]

ii. —— with the technical assistance of Mary KNUTSON & Nellie GREENBURG. **Addendum to Streptomycin in the Treatment of Experimental Relapsing Fever and Leptospirosis Icterohaemorrhagica (Weil's Disease).** *Ibid.* June 13, v. 20, No. 12, 183.

i. Experiments were made to test the action of streptomycin on relapsing fever (*Spirochaeta novyi*) in mice and on leptospirosis (*Leptospira icterohaemorrhagiae*) in hamsters.

Relapsing fever.—A total of 100 Swiss mice were infected by intraperitoneal injection of various amounts of blood of a rat or mouse infected with *S. novyi*. On the following day, when all the mice showed infection in the blood, 50 were given subcutaneous injections of streptomycin; each mouse received 1,000 units a day for four days in divided doses in normal saline—150 units at 9 a.m., noon, 3 and 5 p.m. and 400 units at 9 p.m. In two experiments the 9 p.m. dose was given in beeswax and sesame oil. Thick smears of tail blood, stained with Giemsa's stain, were examined on the 1st, 2nd, 3rd, 4th, 7th, 8th, 9th and 11th days after inoculation.

Spirochaetes were not found in the blood of one untreated and 15 treated mice 24 hours after the first injection, or in 22 untreated and 35 treated mice after 48 hours. Numerous spirochaetes were present in the blood of 10 treated mice 24 hours after the first injection. This result was not so good as that obtained with penicillin [this *Bulletin*, 1944, v. 41, 758].

During the 11 days of observation there were five relapses in the 46 surviving treated mice, and 34 relapses in the 40 surviving untreated mice, but the observation period was short, as relapses in the treated mice appeared on the 11th day and in the untreated mice on the 7th day.

Four of the 50 treated mice and 10 of the untreated mice died; the latter figure indicates that the virulence of the infection was lower than that in a similar experiment with penicillin, where 21 out of 28 untreated mice died.

Experimental Weil's disease.—Fifty hamsters (*Cricetus auratus*) were infected by intraperitoneal injection of the blood of a guineapig in the acute stage of the disease. Twenty-five were given subcutaneous injections of 1,000 units of streptomycin in saline daily, beginning 17 hours after inoculation and continuing for 10 days; each received 200 units at 8 a.m., noon, and 4 p.m. and 400 units at 9 p.m. All the treated animals remained well and all the untreated animals died; inoculation of emulsions of the organs of the treated animals into guineapigs and hamsters failed to infect them.

Another experiment was made to compare streptomycin with penicillin, a preliminary test having shown that the injection of penicillin produced no ill effects in hamsters. Three groups of 12 hamsters were used and there were 12 controls; six of each group were injected with streptomycin and six with penicillin, in divided doses at 9 a.m., noon, 3, 5 and 9 p.m. daily for 10 days. The doses were 250 units for each of the first group, 500 for the second group and 800 for the third.

In Group 1, all the hamsters died; in Group 2, none of the six injected with penicillin died and four of those injected with streptomycin died; and in Group 3, none died. All the control animals died.

The author concludes that streptomycin had a considerable protective action in both infections, but that penicillin was more effective. He suggests that streptomycin may be a useful adjunct to penicillin in the treatment of spirochaetal infections in man. [See also this *Bulletin*, 1944, v. 41, 293, 759 & 942; 1945, v. 42, 210 & 387.]

ii. The author adds the comment that since the unit value for penicillin and that for streptomycin were established on a different basis it may be misleading to compare their action by the numbers of units needed to cure an experimental infection. *J. F. Corson.*

YAWS.

KATZENSTEIN, L. **A Case of Yaws in a White American Soldier.** *Amer. J. Syph.* 1945, May, v. 29, No. 3, 340–44, 4 figs.

A white American soldier was admitted to hospital on March 15, 1944, suffering from yaws of three months' duration which was acquired in New Guinea or neighbouring islands where he had been in military service for nine months. The primary yaw appeared in the first week of December 1943 as a "pimple" on the dorsum of his right foot; secondary lesions were first noticed in the middle of February 1944 in his right axilla, and on admission to hospital he had brownish-yellow crusted papules distributed over his whole body, but chiefly on his legs.

The blood test for syphilis was positive and spirochaetes resembling *Sp. pallida* were present in the papules; the cerebrospinal fluid contained 0·035 per cent. of protein, one cell [per cmm. ?], the colloid mastic test gave 11111-00000, and the Eagle complement fixation test was negative.

The histological characters of an excised yaw are described; there were tiny abscesses in the epidermis and a plasma cell infiltration of the dermis, but no perivascular lymphocytic infiltration such as is seen in syphilis. Intratesticular inoculation of rabbits with material from a papule failed to infect them.

The patient was treated with mapharsen, six doses of 0·06 gm. during three weeks, and two doses of 0·2 gm. of bismuth subsalicylate. Healing of all lesions was complete in three weeks. *J. F. Corson.*

LEPROSY.

ALEXANDER-JACKSON, Eleanor. **Non-Acid-Fast Forms of the Mycobacterium of Human Leprosy.** *Science.* 1945, June 1, 563–4.

The author reports the results of staining material containing the mycobacterium of leprosy with her triple stain (see *Bulletin of Hygiene*, 1944, v. 19, 806, for its composition) which reveals non-acid-fast forms of the tubercle

bacillus. A number of unfixed films of nasal material from a case of leprosy so stained, revealed not only red-stained acid-fast bacilli, but also blue-stained non-acid-fast rods in even greater numbers. Nests of rods may show mixtures of both types, but many nests consisted of blue-stained rods only. Fixed unstained smears from leprous skin biopsies from 32 different cases were next treated with the triple stain and examined, with the following results : 27 (84·4 per cent.) showed zoogloeal and granules or spore-like forms ; 16 (50 per cent.) showed zoogloeal forms only ; 13 smears (40·6 per cent.) showed some acid-fast forms ; 11 smears (34·4 per cent.) showed acid-fast or non-acid-fast rod forms. There were no differences in the findings in patients with different dates of admission, but the oldest, admitted 24 years ago, showed only non-acid-fast zoogloeal forms. In six neural and tuberculoid cases zoogloeal forms and rods were absent. These results strongly suggest that the leprosy bacillus, like the tubercle bacillus, has a zoogloeal form or phase. Further observations with the use of the triple stain are indicated. *L. Rogers.*

Trout, C. L. **The Cultivation of the Lepra Bacillus.** *J. Trop. Med. & Hyg.* 1945, Feb.–Mar., v. 48, No. 1, 8–9.

The author has succeeded in obtaining a pure culture of an acid-fast organism by inoculating a Difco agar medium (containing glycerin) with an emulsion obtained by injecting saline into a leproma and withdrawing it into the syringe. The emulsion contained many acid-fast organisms. During incubation [presumably at 37°C.] carbon dioxide was passed over the medium. The emulsion was kept in the syringe, in the incubator, for six weeks before inoculation of the medium ; by that time filaments had appeared in it.

The author has also grown acid-fast organisms, isolated in previous experiments, in a Difco broth medium through which ammonia gas, or carbon dioxide, was bubbled. *Charles Wilcocks.*

Dharmendra & Mukherji, N. **Attempts to transmit Human Leprosy to Splenectomized Monkeys.** *Indian J. Med. Res.* 1944, Oct., v. 32, No. 2, 197–200.

After a brief review of previous claims to have infected splenectomized monkeys with human leprosy material, the authors record their own experiments. In the first series six *Macacus rhesus* [*Macaca mulatta*] had their spleens removed under chloroform, and after recovery each animal was inoculated intraperitoneally with an emulsion of clippings from the ear-lobes of advanced lepromatous cases, and the inoculation was repeated after two months. External examinations were made, with negative results, and lepromin tests were carried out 16 months later without producing any reaction at the site of inoculation. Post-mortem examination revealed no gross pathological lesions suggestive of leprosy infection ; nor were there any acid-fast bacilli in slightly enlarged glands in one animal, or in a suspicious nodule found in the omentum of another. Claims (Cochrane *et al.*, *Internat. J. Leprosy*, 1937, v. 7, 377) to have obtained positive results through such inoculations were, therefore, not confirmed. *L. Rogers.*

Bechelli, L. M., Keil, H. & Rotberg, A. Resultados da lepromino-reação em paises não endêmicos de lepra. (Nota Preliminar.) [**The Lepromin Reaction in Countries where Leprosy is not Endemic.**] *Rev. Brasileira Leprologia.* S. Paulo. 1945, Mar., v. 13, No. 1, 21–4.

Bargehr, de Langen and others have regarded positive lepromin reactors, among healthy individuals in countries where leprosy is endemic, as suffering from a subinfection owing to contact with patients.

The authors have tested the reaction among those who have never run the risk of any such contact and have compared the results with the Mantoux tuberculin test among those attending the Skin and Cancer Clinic of the New York Post-graduate Medical School. The results are given in tables, from which the conclusions may be thus summarized : The delayed lepromin reaction does not necessarily imply a latent infection. Its specificity is nevertheless upheld by regarding the positive reaction as allergy to the lepromin, developing in the three to four weeks elapsing between the injection and the recording of results. WADE had previously observed positive reactions in non-contacts and explained this by saying that such persons " react allergically on coming into contact with Hansen's bacillus."

The early reaction, occurring in 12 hours or less, may also be observed in non-contacts, and the above explanation obviously cannot be applied to these. It has been suggested, by FERNANDEZ and others, that tuberculosis may be accountable for such. The authors' findings in their cases here recorded (36 only, so far) support this interpretation, for in all but one of those giving this early lepromin reaction the Mantoux reaction was also positive. [This short paper is only preliminary ; further results will be awaited with interest.]

H. Harold Scott.

AMENDOLA, F. A glândula lacrimal na lepra ocular. [**The Lachrymal Gland in Ocular Leprosy.**] *Rev. Brasileira Leprologia.* S. Paulo. 1945, Mar., v. 13, No. 1, 3–11, 1 pl.

The treatment of eye affections in leprosy is far from satisfactory and in spite of all that is done often fails to prevent total blindness ensuing. On an analogy with other inflammatory conditions, determination of the focus and its removal are of primary importance. The lachrymal glands, though they may be few, nevertheless by their continuous secretion, if infected, are a constant source of reinfection and consequently of great moment in the evolution of leprotic lesions of the eye.

The author quotes the case of a patient who had undergone three operations for ocular lepromata in six months, each in turn followed by a relapse. It was decided to extirpate the lachrymal gland and the result was a resolution of the congestion and the ocular lesions.

Appended to the article are brief notes of 20 cases ; nearly all the patients had had treatment of all kinds without lasting benefit and had then submitted to removal of the lachrymal gland. In a few days (three-four) the pain and photophobia disappeared and the patients expressed themselves as feeling better and the general outlook in every sense of the term rapidly improved. The author speaks emphatically in favour of this operation for the ocular lesions of leprosy, stating that in the majority of cases histological examination shows that the gland is infected and " even in cases in which the pathological anatomy is negative, extirpation is not contra-indicated because clinically benefit nevertheless follows."

H. Harold Scott.

DHARMENDRA & CHATTERJI, S. N. **Trigeminal Neuritis simulating Leprosy.** *Leprosy in India.* 1945, Apr., v. 17, No. 2, 40–43, 2 figs.

AMENDOLA, F. A traqueotomia na lepra. [**Tracheotomy in Leprosy.**] *Rev. Brasileira Leprologia.* S. Paulo. 1945, Mar., v. 13, No. 1, 27–30.

The circumstances in which tracheotomy is undertaken in lepers differ from those in other, non-leprous, patients, for, in the latter, the operation is a matter of immediate urgency on account of acute obstruction, as in laryngeal diphtheria, an impacted foreign body, acute oedema, and such-like, whereas in

lepers, in nearly all cases, the operation is undertaken without haste in cases of gradually increasing obstruction, and the earlier stages have been treated by cautery, for example, or removal of a leproma. Again, the site is often analgesic so there is less need for general anaesthesia, but, on the other hand, if general anaesthesia is needed there is no little risk on account of cardiac or pulmonary disease. Hence there is often need for preliminary administration of cardiac tonics. The low operation is to be preferred. A second operation, some time later, may be required, although the tube is in good position ; this is due to the formation of a thick muco-membranous exudate below the cannula which is difficult to remove ; the operation is then one of urgency and death may occur before relief is obtained.

The author's remarks are based on 26 cases ; 11 patients died [but a table gives 10 only], two during the operation, one from syncope, the other owing to the advanced stage of his disease, and the operation could not be completed. Of the others one died a month later, one six months later, three lived for a year, two for 2½ years, and one for 3 years. All these died from cachexia due to the leprosy or from intercurrent maladies. *H. Harold Scott.*

Aller Atucha, J. F. Sulfatiazol en las manifestaciones leprosas. Mácula—Infiltración — Lepromas — Pénfigo — Ulceras — Conjuntivitis — Saturación sanguínea. [**Sulphathiazole in Leprotic Lesions.**] *Rev. Asoc. Med. Argentina.* 1945, May 15, v. 59, No. 557, 497–505, 12 figs.

The work which this article records was carried out in 1942 and was reported at the Second Medical Congress in the Argentine. The results which the author mentions are in some cases little short of miraculous, as, for example, cicatrization of a perforating ulcer of the foot in five days, but nothing is said of their permanency, only the immediate results are told. The drug was used as a 15 per cent. jelly, or as a 10 per cent. oily suspension, or a 15 per cent. watery emulsion (crema acuosa). For extensive and generalized lesions a 5 per cent. sodium salt was injected intravenously.

Various forms and stages of the disease were thus treated and a short note of a few lines is given on each case. First, the macular, three in number ; the places were scraped once a week and then the watery preparation was rubbed in three or four times daily, for 1–3 months. Two improved, the third made no progress. Five cases of leprous infiltration all showed great improvement in 2–4 months by three or four rubbings daily with the same preparation. Two patients with lepromata were treated ; the leproma in each case was incised, the contents evacuated and the jelly preparation then applied ; cicatrization was complete in 10 days in the one, in 15 in the other. Patients with ulcers of various sizes and depth were treated with the jelly for periods up to 3½ months. In one, with multiple ulcers of the right thigh and knee, " all the ulcers were completely cicatrized " in 11 days. Those with eye lesions the author divides into (i) Hyperacute, in which the sequence of events is rapid, with diffuse keratitis, iritis, exudation into the anterior chamber, haemorrhage and intense pain leading soon to blindness. Two cases of this type are mentioned ; the oily suspension was used and in 16 and 14 days respectively sight was perfect and the treatment was stopped. (ii) Acute, in which the symptoms were similar but less severe ; one case only of this is reported. In two months the subjective symptoms disappeared and vision improved. (iii) Subacute, with small infiltrations and nodules affecting also the lids, with conjunctivits and irido-cyclitis ; one case which improved in ten weeks, the patient stating that whenever treatment was suspended the symptoms recurred. (iv) Chronic, with plastic changes ; 19 cases mentioned, of which 13 improved while 6 remained unaffected.

One patient, a woman of 51 years, had generalized lesions, on face, neck, trunk and limbs, maculae and infiltrations. She was given injections of 20 cc. intravenously every six hours for four days, then every eight hours for the same period, then every 12 hours for another four days. She was also given chaulmoogra, 5 cc., and propidon every four days; altogether she had 36 gm. of sulphathiazole (with a blood-content of 4 mm. per cent. [so stated]), 30 cc. of chaulmoogra and three ampoules of propidon. She tolerated the drugs well and 4½ months after the first course she underwent a second, and four months later a third. The maculae presented "a modification in colour and shape, very few fresh lesions appeared, and during the whole period, one year, the leprous reactions were fewer and less intense." *H. Harold Scott.*

Dharmendra & Mukherji, N. **The Effect of Sulphapyridine on Experimental Rat Leprosy.** *Indian J. Med. Res.* 1944, Oct., v. 32, No. 2, 201-3.

Variable results have been reported by different experimenters as to the effect of sulphonamides on rat leprosy bacilli. The authors report on a trial of sulphapyridine (M. & B. 693) ground up and suspended in normal saline and injected through an oesophageal cannula into the stomachs of rats. The dose was 10 mgm. daily, gradually raised to 40 mgm., in white rats weighing 80 gm. The administration was commenced two or three days before inoculating the animals with the infective dose of bacilli, and was continued for several days, and after two weeks' interval, 10 to 20 mgm. were given daily for another 2½ months. In the first series 18 were so treated and 20 used as controls; but no differences in the nature or extent of the lesions were found. A second series with slightly different doses also yielded negative results. The drug therefore does not appear to have any inhibitory effect *in vivo* on *Myco. leprae muris*, although *in vitro* it has been shown to have a bactericidal effect in a dilution of 1 in 1,000. *L. Rogers.*

Fielding, J. W. **Rat Leprosy: Observations and Transmission.** *Med. J. Australia.* 1945, May 12, v. 1, No. 19, 473–86, 18 figs. (12 on 1 pl.) [Numerous refs.]

This is a detailed, and well illustrated, account of comprehensive investigations, the value of which is enhanced by brief summaries of earlier work on each point dealt with and a full list of references. It brings out some important points and should be read in full by research workers.

After reference to the geographical distribution of rat leprosy, the distribution of the causative organism in the body is dealt with. A number of heavy infections of the sternum are recorded. Infection of glands is variable and most frequent in connexion with invasions of the skin. The author confirms the observation by Krakower and Gonzalez (*Science*, 1937, Dec. 31, 617) of lepra cells in the pancreas. He has also found graded infection of the stomach, pylorus and duodenum, which is very much heavier in experimentally infected rats than in those naturally infected. Moreover, the organisms in the faeces are so numerous that they can no longer be regarded merely as elimination products, for all infected rats kept for a long period show heavy faecal infections. Microscopical examinations of the whole of the alimentary tract from the tongue to the anus were therefore made; they revealed heavy infections of the stomach, with destruction of the mucosa at the cardiac end, and a progressively decreasing infection through the pylorus to the duodenum. The rest of the tract was either unaffected or contained only scattered loose organisms. Contrary to the opinion of Lowe [this *Bulletin*, 1938, v. 35, 302], the author found that repeated inunction of intact skin with emulsions of the

rat leprosy bacilli resulted in extensive bacillary invasion of the skin associated with clinical lesions with intracellular organisms long before extensive internal lesions could occur. As faecal organisms had been found capable of infecting rats through the skin, those portions of the surface of the body in contact with the ground were examined, and in most experiments definite invasion of the skin by the organisms was found. The distribution of the organisms is therefore much more general than has hitherto been realized; for to the list put forward by various authorities the following localities should be added: stomach, pylorus, duodenum, pericardium, bulbo-urethal and preputial glands (he only examined male rats) and sternum. A link has also been provided between soil contamination and dissemination of the disease, as suggested by WALKER and SWEENEY [this *Bulletin*, 1929, v. 26, 1032]. Evidence is also recorded to show that the urine commonly contains over a million rat-leprosy bacilli per cc. and the faeces far larger numbers.

Microscopical work indicates that the lepra cells in superficial lesions arise from polymorphonuclear leucocytes, the nuclei of which become gradually destroyed with the multiplication of the bacilli in the cells. Of greater interest are the author's observations on the virulence and viability of the organism. The resisting power of the rat leprosy bacillus is shown by the fact that those obtained from the faeces of infected animals are equally capable of producing infection through the skin after contact with antiformin for 24 to 48 hours. Moreover, fresh faecal organisms appear to be much more constant in virulence than organisms from urine or those of primary ulcers. His results indicate that the bacilli of granulomata and long-standing ulcers have a low standard of virulence, while the virulence of organisms from primary ulcers, urine and faeces is on a higher plane. For the production of superficial lesions two things are necessary: first, breaking down of local and general resistance by repeated inunction or subcutaneous inoculation of the organisms of various types; and second, the use of organisms of high virulence, the continued inunction of which can produce both internal and external clinical lesions. Doubtless natural infection in wild animals is the result of repeated contact with soil infected by organisms voided in the excreta of rats. Rat lice may also infect by their bites, and emulsions of such lice produce infection when inoculated into rats.

Resistance and immunity are next dealt with. When organisms of low virulence are used to infect by inunction at long intervals, the early lesions thus produced completely disappear in time, probably as the result of the production of immunity in the animals. In experimental rat leprosy vitamin B_2 deficiency had no demonstrable influence on infection. In laboratory animals bacilli usually appeared in the urine about 260 days after primary inoculation. Faecal organisms given by the mouth in water did not infect. Hookworm larvae can take up the bacilli present in faecal cultures, and infections can be produced by the agency of these larvae, which rapidly penetrate the skin of an animal. *L. Rogers.*

DE SOUZA-ARAUJO, H. C. Infecção experimental de carrapatos (Amblyomma cajennense) em ratos com lepra Stefansky. [**Experimental Infection of *A. cajennense* with the Bacilli of Rat Leprosy.**] *Mem. Inst. Oswaldo Cruz.* 1943, v. 38, No. 2, 183–6, 2 figs. English summary (5 lines).

LINHARES, H. Verificação de lepra murina na cidade do Rio de Janeiro. Sua distribuição geográfica e considerações endemiológicas. [**Confirmation of the Presence of Rat Leprosy in Rio de Janeiro.**] *Mem. Inst. Oswaldo Cruz.* 1942, v. 37, No. 3, 353–73. [59 refs.] English summary.

HELMINTHIASIS.

CORT, W. W. **The Germ Cell Cycle in the Digenetic Trematodes.** *Quart. Rev. Biol.* 1944, Dec., v. 19, No. 4, 275–84. [23 refs.]

This paper is a valuable critical review of our knowledge of this subject. Explaining that earlier workers regarded the multiplication of individuals which occurs in the germinal sacs (mother and daughter sporocysts) of trematodes as asexual internal budding (metagenesis), Cort refers to GROBBEN'S suggestion that it is heterogony effected by truly parthenogenetic eggs in the germinal sacs, and to other workers who have described testes and ovaries in the mother sporocysts of some trematodes (*Bucephalidae*). Cort accepts the view, orginated by LEUCKART, that the reproductive cells of the sporocysts and rediae (germinal cells or cells of the germinal line) can be traced directly back to the fertilized ovum of the adult trematode and that they never become true germ cells and are never localized in testes and ovaries. Most recent work (which is discussed in some detail by the author) suggests that all of them arise from one fertilized ovum of the adult trematode and remain separate until they finally form the ovaries and testes of the new adults derived from the cercariae. In other words, the fertilized ovum of the adult trematode (zygote) produces sporocysts and rediae by a process of polyembryony which continues throughout the cycle in the molluscan intermediate host. The only true germ cells are the cells of the ovaries and testes of the adult trematodes. These undergo gametogenesis to produce sperms and eggs which have the reduced number of chromosomes. This reduced number is present only in the sperms and ova of the adult, never in the cells which produce the sporocysts and rediae. This view requires, in Cort's opinion, much more investigation carried out on a wider range of trematode species ; but it is a valuable working hypothesis and is the only one which seems to fit the facts.

The methods by which sporocysts and rediae are produced are discussed. The evidence available suggests that the multiplication of the original zygote produces cells of the germinal line (germinal cells) which reproduce by polyembryony to produce large numbers of cells of the germinal line, which remain separate and lie in the body-cavities of the germinal sacs (mother and daughter sporocysts). In the two species most studied (*Paragonimus kellicotti* and *Parochis acanthus*) reproduction seems to be only by direct division of the cells of the germinal line (primary polyembryony) ; the secondary germinal sacs are rediae, and reproduction is more limited than it is in groups like strigeids, schistosomes and plagiorchids, in which the secondary germinal sacs are daughter sporocysts. In these latter groups primary polyembryony is supplemented by secondary polyembryony with the production of peculiar *germ masses*, composed of both unicellular and multicellular components. From these the largest multicellular components break away and develop into daughter sporocysts or cercariae, as the case may be. In some species this secondary polyembryony may continue for long periods, producing large numbers of individuals. In the Strigeidae, secondary polyembryony of germ masses has become the chief method of reproduction in both the primary and the secondary germinal sacs. In schistosomes, primary polyembryony of germinal cells in both the mother and the daughter sporocysts plays a much larger part in the multiplication of individuals than in Strigeidae, but secondary polyembryony does occur, although the germ masses are simpler and more transitory. In plagiorchids there is yet another difference. The primary germinal sacs (mother sporocysts) are complex and produce larger numbers of daughter sporocysts than those formed by any other group yet studied. This is apparently entirely effected by direct division of the cells of the germinal line (*i.e.* by

primary polyembryony) ; no germ masses have been found. But in the secondary germinal sacs (daughter sporocysts) primary polyembryony seems to be very limited. Each daughter sporocyst produces very early a single, large germ mass and this persists throughout and gives rise to very large numbers of cercariae. Secondary polyembryony is thus responsible for the very large numbers of cercariae produced by this group. Further study may reveal yet other relations between primary and secondary polyembryony ; or even different mechanisms altogether. Existing evidence suggests that primary polyembryony is the primary method of multiplication and that secondary polyembryony is a secondary adaptation which make possible an extraordinary multiplication of individuals. *G. Lapage.*

Giffen, H. K. **Schistosomiasis (Bilharziasis) and Egyptian Splenomegaly.** *Amer. J. Clin. Path.* 1945, Jan., v. 15, No. 1, 10–16, 14 figs. on 4 pls.

This is a short and clear account of schistosomiasis which was read at a meeting of the American Society of Clinical Pathologists at Chicago on June 10, 1944. It is illustrated with 12 photographs, nine of which are photomicrographs. The text appears to contain nothing new. *J. F. Corson.*

War Medicine, Chicago. 1945, June, v. 7, No. 6, 397–405, 1 fig. **Schistosomiasis Japonica.** War Department Technical Bulletin. TB Med 167.

Baylis, H. A. **On the Probable Identity of a Cestode of the Genus *Diphyllobothrium* occurring in Wales and Eire.** *Ann. Trop. Med. & Parasit.* **1945, May 31, v. 39, No. 1, 41–5.** [13 refs.]

In this paper Baylis describes more fully the adults of the species of *Diphyllobothrium* reared experimentally in rats and dogs by Duguid and Sheppard [this *Bulletin*, 1944, v. 41, 857] from plerocercoids which caused the death from general peritonitis of trout in a South Wales reservoir, and those obtained by Hickey and Harris [this *Bulletin*, 1944, v. 41, 858] from the intestines of gulls and cormorants. Hickey and Harris also found plerocercoids in trout in reservoirs near Dublin. Unsworth [this *Bulletin*, 1945, v. 42, 397] reared the adults from South Wales plerocercoids received from Duguid and Sheppard and also from Dublin plerocercoids received from Hickey and Harris ; both were reared in dogs. Baylis [this *Bulletin*, 1945, v. 42, 302, 397] has already expressed the opinion that the adult Diphyllobothriidae obtained from the Dublin gulls belonged to one species and those obtained from the Dublin cormorants to another ; and that all the adults reared experimentally by the workers mentioned above strongly resembled the species obtained from the Dublin gulls ; he considers that all these adults (except those from cormorants) probably belong to the species *D. dendriticum* (Nitsch, 1824), which is normally a parasite of gulls.

In the paper here reviewed Baylis gives the evidence in favour of this conclusion. It is a valuable clarification of our knowledge of the Diphyllobothriidae and makes clear the differences between the above species and *D. latum* of man. For a better understanding, says Baylis, of the specific and other characters of the species of *Diphyllobothrium*, we need a comparative study of considerable numbers of specimens from naturally-infested hosts, and this study might lead to the conclusion that the adult Diphyllobothriids of birds belong to two species only, namely, *D. dendriticum* (Nitsch, 1824) and *D. ditremum* (Creplin, 1825). The species obtained by Hickey and Harris from cormorants was very probably *D. ditremum* and, if this is true, the cormorant is a new host for this species [see also Gibson, this *Bulletin*, 1945, v. 42, 396, and Harris and Hickey, *Nature*, 1945, Oct. 13, 447]. *G. Lapage.*

DIXON, H. B. F. & HARGREAVES, W. H. **Cysticercosis** (*Taenia solium*). **A Further Ten Years' Clinical Study, covering 284 Cases.** *Quart. J. of Med.* (n.s.) 1944, Oct., v. 13, No. 52, 107–21, 6 pl. figs. [26 refs.]

This excellent paper is so full of interesting and informative matter that it cannot be compressed satisfactorily. Of the 284 cases which are studied here, all but four occurred in soldiers or in military families, but this figure, although impressive, is not complete for the period under review, nor is such a claim made. Twenty-six per cent. of the patients gave a history of tapeworm infestation, so that auto-infection appears to be common, although the proportion in which the identity of the parasite was established is not stated. The authors point out, rightly, that tapeworm infestation may be overlooked by the host, but mistakes take place in the opposite direction also, especially if the patient's own statement has to be relied on, *faute de mieux* In the reviewer's experience, one man when asked to make a rough sketch of the " tapeworm segments " which he confidently asserted he had passed, produced recognizable drawings of several *Ascaris*, his honest misstatement resulting from suggestion on the part of some former questioner.

Calcified cysts were detected in the brain in 11 per cent. ; in other words, in 89 per cent. of proved cases, radiographic examination of the skull was negative. Yet it is still common to find that in suspected cases, cysticercosis has been " excluded " on the evidence of a single negative radiograph limited to the brain ! In showing up calcification, " high penetration " was found more effective than " the slight under-exposure advocated by Morrison." This statement may puzzle a reader not already familiar with Morrison's technique, for " penetration " and " exposure " are not comparable terms. What he advocated was, " ordinary exposure conditions *for bone detail*, with a very slight under-exposure." In the experiments which led to the adoption of this standard, the reviewer cannot recall any instance in which calcification appreciable to the eye in a parasite removed from the body, failed to show in radiographs taken of it *in situ*, using the procedure finally chosen, as indicated above. If, on further trial, the authors' technique proves consistently superior to that advised by Morrison, strictly followed, this is a notable advance. The fact remains, however, that only in a minority of cases do the degenerative changes in intracerebral parasites go on to calcification.

The reviewer is charged with having painted too gloomy a picture of this disease. He agrees as regards his original estimate, which was coloured by several tragic happenings about that time. This view, however, was qualified in a later publication where several more favourable types of the disease are recognized. (This article is included in the authors' list of references.) Even so, he takes a less assured view than is adopted in their assessment, where 36 per cent. of the cases are classed as " showing improvement," and 15 per cent. as " now recovered." In arriving at this estimate, no doubt the authors have striven to guard against the known fallacies which have to be borne in mind in dealing with this uncertain and treacherous disease. It might be well to mention some of these disturbing factors, for they are not as widely known as they should be. In the seemingly milder type of case, the investigator may have to rely mainly, or even entirely, on the patient's own statements. Those who hope to obtain, or fear to lose, some job, often understate the degree of disability present. Others try to hide it altogether, sometimes with surprising success ; their fits may be nocturnal, or infrequent, and those who can recognize from some sensation that they are " working up for a fit," may manage to disappear for a few hours on some pretext. One man in this last category served as a municipal bus conductor for a long period, and escaped detection. Another man, originally invalided from the Army for major epilepsy, was

demonstrated to a group of neurologists as an extensive infestation which had never produced any symptoms, which shows that the very elect may be deceived. Others quite honestly report themselves as "getting on fine," or "better than I was," until some exacerbation changes the picture. Two men in this optimistic group remained under the reviewer's continued observation for about three years each. One, in spite of his persistent claim to steady progress (supported by a decrease in his major seizures to about two a year, and by full-time employment), developed a sudden left-sided hemiplegia. The other, at his final examination, as usual reported favourably on his condition, though he mentioned headache "for the last day or two." He died three weeks later in a state of wild mania. Again, mental deterioration may be so gradual in onset as to pass undetected even at a medical re-examination, and the subject's inaccuracies and omissions may not be realized unless the note-taker knows the correct answers in advance. Moreover, the general run of cysticercosis patients are not brain workers, nor are their hobbies often of an intellectual type, and so a degree of mental retrogression that would be obvious to friends and colleagues in other walks of life, may pass unobserved.

Recovery in brain cysticercosis will result if all the intracerebral parasites have died off, and degenerated, without causing material and irreparable damage, and if organized inflammatory exudates do not undergo some later and hurtful change. At what point the morbid processes in cysticercosis have finally come to an end, unfortunately cannot be determined. The reviewer has seen a cysticercus which had remained alive in the brain for at least 15 years, thus with its most dangerous period still before it, and even a single parasite, suitably situated, may cause death or disablement. In his experience, relapse has followed symptom-free intervals which had lasted for 10, 13 and 20 years. He believes that when a long remission occurs, one can but wait and hope for the best, while cautiously remembering the scriptural injunction, "Judge none blessed before his death."

The foregoing comments and excursions are not meant to detract from this valuable paper, and are mainly an elaboration of a few points in the text, introduced in the hope of clearing up some common misunderstandings regarding this difficult subject. The original paper deserves wide circulation, and special attention is called to the striking case histories which are given with admirable clarity and effect. *W. P. MacArthur.*

Arana, R. & Asenjo, A. **Ventriculographic Diagnosis of Cysticercosis of the Posterior Fossa.** *J. Neurosurgery.* 1945, May, v. 2, No. 3, 181–90, 11 figs. [24 refs.]

During a period of about three years, 202 cases of "intracranial tumour" were investigated at the Central Institution for Neurosurgery in Santiago, Chile. Twenty-five of these proved to be brain cysticercosis. Only in five were the parasites supratentorial in position. The remaining 20 form the basis of this study. In 13 the predominant localization was in the posterior fossa, and in 7 the brain invasion was in the fourth ventricle. The diagnosis was confirmed in all cases, either surgically or by autopsy. Four of the fourth-ventricle cases came to autopsy, and in these, no parasites could be discovered elsewhere in the body; an instructive demonstration of the mischief that one single cysticercus may bring about. In the remaining three, the solitary cysticercus was removed from the fourth ventricle, and two of the patients were reported "in good condition," six and eight months respectively, after operation.

All the 20 cases were studied by ventriculograms obtained by injection of air, with the following conclusions :—

"The X-ray findings that point to cysticercosis of the posterior fossa are: (1) hydrocephalus, (2) absence of displacement of the ventricular system, especially of the aqueduct; and (3) partial obliteration of the aqueduct and fourth ventricle with presence of air in both and in the cisterna magna. These same features can be observed in cases of single cysticercosis of the fourth ventricle. In the latter, the contours of the cysticercus may be outlined."

The reader who is familiar with cysticercosis will notice some curious points in this paper, among them the following:—In the great majority of the patients (20 of the original 25), the parasites were infratentorial in situation; the symptoms were exclusively those associated with cerebral tumour—headache, vomiting, eye changes, and so forth—with absence of the common cysticercal epilepsy; all the parasites removed by operation or at autopsy were racemose and non-encysted, a result of their localization. These are, more or less, divergences from the usual experience in brain cysticercosis. It looks, therefore, as if the commoner types which would bring the above more into their proper proportions may not be coming to light. On the other hand, the authors may have made some selection of the type of case required for their particular line of research, but this is not indicated in the paper. Perhaps the explanation is that only patients supposed to be suffering from a cerebral tumour were sent to the institute for investigation. *W. P. MacArthur.*

Niño, F. L. Contribución al tratamiento quimioterápico de la teniasis por *Taenia saginata*. [**Contribution to the Chemotherapeutic Treatment of Taeniasis due to** *Taenia saginata*.] *Bol. Inst. Clín. Quirúrg.* Buenos Aires. 1944, Nov.-Dec., v. 20, No. 168, 813–30. [17 refs.]

After discussing the unsatisfactory action, toxicity to the human host, and other disadvantages of known remedies for infestations with *T. saginata* (male fern, kousso, kamala, hexylresorcinol, carbon tetrachloride, etc.), the author gives the results of his treatment with acranil (Bayer) in 50 subjects. He concludes that acranil is an ideal anthelmintic for these infestations. It is also effective against *Giardia intestinalis*. The author has previously published the results of his earlier treatment of 24 subjects with acranil in *La Prensa Medica Argentina* (1942, v. 29, 1242) and *Boletin del Instituto de Clinica Quirúrgica* (1942, v. 18, 279).

Acranil (Bayer), originally called Sostol, is an acridine compound of the atebrin [mepacrine] type with a yellow colour and bitter taste. It is soluble in water and in citric and tartaric acids, very soluble in 1 to 3 per cent. HCl, feebly soluble in alcohol and insoluble in very dilute or concentrated NaOH or sodium carbonate. Its toxicity is low. It is marketed in the form of sweetened dragees each containing 0·1 gm., which are easy for even children of three years old to swallow. The adult dose is 0·6 gm. for a single administration, but it is better to divide it into two doses. The author gave his subjects 6 to 8 dragees and often gave up to 0·8 gm. without inconvenience to them. These doses can be repeated if necessary after 15–30 days.

The preparation of the patient is very important for the treatment of taeniasis. Two hours after a normal breakfast, the subject has a vegetable or mineral laxative. Lunch is bland and light and only liquid diet is allowed after midday. Before sleep a soap and water enema is given and that night half the dose of acranil is administered. On the second day the subject is kept fasting in bed and has the second half of the dose. At 3 p.m. on that day he has 40 gm. of sodium or magnesium sulphate, or a castor oil or other purge. After this has acted, the diet is gradually returned to normal. All the faeces are collected and searched for the tapeworm head. Of the 50 subjects thus treated only seven showed symptoms of intolerance of the drug, namely nausea (in five

subjects), vomiting (in two), abdominal pain (in one), diarrhoea (in one) and yellow colouration of the skin (in three). This rarity of toxic symptoms is contrasted with the effects of carbon tetrachloride and other taenicides in use.

Of the 50 subjects, 34 were cured by a single treatment, 3 were cured after 2 doses and 1 after 3 doses; 3 were not cured; 6 were still under observation at the time of writing and the effects upon 3 could not be followed. Thus, out of 41 subjects 38 (92·6 per cent.) were cured. The author compares this high percentage of cures with the 97 per cent. of cures claimed by CARMAN [this *Bulletin*, 1930, v. 27, 954] after giving doses up to 4 cc. of carbon tetrachloride, and the results of GAMINARA and TALICE (*Octava Reunión de la Soc. Argentina de Patología Regional del Norte*, 1934, 550) which confirm, the author says, Carman's results. He also refers to the use of carbon tetrachloride by DAUBNEY and CARMAN [this *Bulletin*, 1928, v. 25, 932] and by MAPLESTONE and MUKERJI [this *Bulletin*, 1932, v. 29, 414. See also the 80 per cent. of cures obtained with carbon tetrachloride by the same authors, this *Bulletin*, 1943, v. 40, 925] and to the work of GAMINARA (*Arch. Uruguayos de Med., Cirugía y Especialidades*, 1934, v. 4, 583).

The test of cure was either the finding of the head, which was found in only 6 of the 38 subjects cured, or subsequent clinical observation and examination of the faeces. The author says that *T. saginata* requires at least two months for its regeneration before eggs can again be laid. Clinical and parasitological observation of the 32 subjects in whom the head was not found showed that cures lasted for periods varying from more than three months (two subjects) to more than six months (seven subjects), more than one year (five subjects), more than two years (five subjects), and more than three years (13 subjects). The tapeworms passed were coloured an intense yellow by the acranil. The age of the subjects varied from 3 to 60 years; 19 were males and 19 females. The author suggests administration of acranil by means of a duodenal sound to avoid the symptoms of intolerance. [The author gives the formula as the hydrochloride of chloromethoxyacridylaminodiethylaminopropanol; it has been given (this *Bulletin*, 1943, v. 40, 439) as 3-chloro-7 methoxy-9 diethylamino-β-hydroxy-propylamino-acridine dihydrochloride.]

The author quotes the experience of two other workers with this drug in *T. saginata* infestation. *G. Lapage.*

RIVAS, C. I., GÓBICH, E. & MANTILLA, L. R. Estadística de la hidatidosis en el Instituto de Clínica Quirúrgica. [**Statistics of Hydatid Disease in the Institute of Clinical Surgery.**] *Bol. Inst. Clín. Quirúrg.* Buenos Aires, 1944, Nov.–Dec., v. 20, No. 168, 845–55.

——, —— & ——. Consideraciones sobre la estadística de la hidatidosis en el Instituto de Clínica Quirúrgica. [**Considerations on the Statistics of Hydatid Disease in the Institute of Clinical Surgery.**] *Ibid.* 856–7.

The second of these two papers briefly summarizes the first. For details, the latter itself must be consulted; only its main conclusions can be given here. The authors analyse the records of cases of hydatid disease operated upon at the Institute of Clinical Surgery during the period April 12, 1919, to December 1, 1943, and compare these with similar reports published in 1922 and 1932. From 1919 to 1922 there were 95 cases (32 per year), from 1922 to 1932, 387 cases (39 per year), from 1932 to 1943, 263 cases (24 per year). In the latter period, out of the 30,601 operations of all kinds done, 748 (2·4 per cent.) were for hydatid. But many cases are now operated upon near their homes in centres established by the Institute's campaign against this grave disease. Among the 748 subjects, 425 had liver cysts, and 155 lung cysts. The authors regard these as infestations conveyed by the venous route and they also include

in this category the 78 peritoneal cysts, which are, they think, secondary to liver or splenic cysts (primary peritoneal hydatids being, in their opinion, exceptional). Thus 87·85 per cent. of the 748 subjects were infested by the venous route and 12·15 per cent. by the arterial route ; these figures accord with figures, which are, the authors say, accepted as average values, namely, 85 per cent. by the venous and 15 per cent. by the arterial route. During the period under review, liver cysts have decreased from 63 per cent. in 1922 to 56 per cent. in 1943, a fact which is also attributed to the campaign against the disease. The mortality at or immediately after operation was 10·9 per cent. in the report published in 1932 and is 12 per cent. in the present report. The mortality of subjects with liver cysts was also 12 per cent. ; that of subjects with lung cysts was 14·83 per cent. ; and that of subjects with peritoneal cysts 15·38 per cent. Clinical histories showed that 35 per cent. of subjects with liver cysts had not shown symptoms for longer than six months, while others had shown symptoms for periods varying from six months to more than 20 years. The commonest symptom was evidence of the presence of a tumour of the liver (in 80 per cent. of subjects), while 68 per cent. had liver pain (diffuse or colicky), and 18 per cent. had jaundice. The position of the cysts on the liver is discussed. Liver cysts co-existed with cysts elsewhere in 52 of the subjects, most often in the peritoneum. Similar figures are given for cysts in the lungs, peritoneum, spleen, kidneys, bones, abdominal and thoracic body walls, muscles and other sites. The surgical technique adopted for treatment is described. [In the same issue of this *Journal* (p. 838) Rivas discusses more fully the surgical treatment of hydatid cysts of the liver.] Mortality can be but little affected by improvement in treatment ; prophylaxis alone is useful until " biological treatment " [presumably the biological treatment of CALCAGNO (1939, *Boletines y trabajos de la Acad. Argent. de Cirúrg.*), based on the increase of heterophilous antibodies after injection of hydatid fluid into subjects with hydatid cysts (see also GRAÑA this *Bulletin*, 1944, v. 41, 764)] can be developed sufficiently to replace surgery. *G. Lapage.*

EINHORN, N. H., MILLER, J. F. & WHITTIER, L. **Intestinal Polyparasitism : Clinical Survey of One Hundred and Sixty-One Cases of Infection with Multiple Intestinal Parasites in Children.** *Amer. J. Dis. Children.* 1945, June, v. 69, No. 6, 350–58.

This is an account of one of five surveys of 516 children in Gorgas Hospital, Ancon, Panama Canal Zone, made during 1941, 1942, and 1943 ; they were infested with one or more of five species of intestinal nematodes—*Ascaris lumbricoides*, *Enterobius vermicularis*, " hookworm," *Trichuris trichiura*, and *Strongyloides stercoralis*. Of these, 357 were infested with single species, and 161 had more than one species ; the former group has been separately reported on [this *Bulletin*, 1945, v. 42, 578 ; and below] and the present paper refers to the latter group.

Of the 161 children, 116 lived on farms or in rural communities with primitive living conditions and no sanitation ; 130 were of mixed race and 29 were negroes. Their ages ranged from 9 months to 12 years, and only six were under two years.

As most of the patients were admitted for other diseases, it was difficult to relate symptoms and some laboratory findings to the presence of the worms ; it was found, however, that eosinophilia above 4 per cent. occurred in 30 (18·6 per cent.) only, and in 14 of 42 who had no other disease besides helminthiasis.

In treatment, hexylresorcinol was the safest, most efficient and easiest to administer of the vermifuges used ; tetrachlorethylene was most effective for hookworm infestation, and gentian violet, in enteric-coated tablets was effective

in oxyuriasis, but large doses (1 grain t.d.s.) caused nausea and vomiting. *Leche de higueron* (the latex of *Ficus laurifolia*) was found ineffective in trichuriasis. *J. F. Corson.*

MILLER, J. F., EINHORN, N. H. & WHITTIER, L. **Ancylostomiasis and Strongyloidiasis : a Clinical Survey of Seventy-One Cases of Ancylostomiasis and Eleven Cases of Strongyloidiasis in Children.** *Amer. J. Dis. Children.* 1945, June, v. 69, No. 6, 359–65.

Some of the 357 children in the Gorgas Hospital [see above] were infested with either hookworm (71) or *Strongyloides stercoralis* (11) alone. Of the 71 with hookworm, 52 lived in rural districts ; there were 46 boys and 25 girls ; 34 were of mixed race and 33 were negroes. They showed few symptoms attributable to helminthiasis, but they had been admitted for other diseases, chiefly malaria. In the other group of 11 children, *S. stercoralis* apparently caused symptoms of illness—vomiting in 2, diarrhoea in 2, while others had loss of weight, headache, or abdominal tenderness. " Gentian violet was found to be relatively effective in reducing the number of parasites." *J. F. Corson.*

HAWKINS, P. A. & COLE, C. L. **Studies of Sheep Parasites. V. Immunity to Gastrointestinal Nematodes.** *J. Parasitology.* 1945, Apr., v. 31, No. 2, 113–18, 4 figs. [14 refs.]

The authors briefly summarize earlier work which showed that the exsheathed larvae of nematodes parasitic in sheep react to the serum of sheep resistant to infestations with them ; they react by forming a precipitate at the mouth, anus, excretory pore, or on the cuticle. These precipitates are formed round the larvae of *Nippostrongylus muris* of the rat (SARLES, *J. Parasitology*, 1937, v. 23, 560, and *J. Infect. Dis.*, 1938, v. 62, 337), *Ancylostoma caninum* [OTTO, this *Bulletin*, 1940, v. 37, 593], *Trichinella spiralis* [MAUSS, *ibid.*, 1941, v. 38, 528] and OLIVER-GONZÁLEZ [*ibid.*, 1941, v. 38, 528 ; 1942, v. 39, 627], and *Ascaris lumbricoides* of the pig [OLIVER-GONZÁLEZ, *J. Infect. Dis.*, 1943, v. 72, 202].

The authors obtained serum from three lambs and one ewe which had recovered from a natural infestation with several species of intestinal nematodes. Larvae were cultivated from similar mixed infestations, washed repeatedly in sterile distilled water, allowed to stand overnight, again washed in sterile water and then put in 0·1 per cent. mercuric chloride for half an hour. The larvae were then put into 0·2 per cent. calcium hypochlorite to exsheath them. For the serum tests the larvae were put in the sera on slides ringed with wax and kept at 37°C. and examined several times a day. Figures show the precipitates deposited round exsheathed larvae thus kept in sera of resistant sheep ; no such precipitates were seen around the larvae when they were kept in sera of lambs reared free from nematode parasites ; nor around larvae kept in saline solutions. A diagram indicates the relationship between the total egg counts of the faeces of the lambs and the percentage of precipitate formed in the sera. The authors suggest that it is the antibodies formed in the sheep which form these precipitates and that, when larvae are embedded in the gastric or intestinal mucosa, they " may be immobilised by this antibody " and that then phagocytes may destroy them. [See also the immobilization, stunting and precipitates found around the larvae of *Nippostrongylus muris* in rats resistant to infestations with this species described by TALIAFERRO and SARLES, this *Bulletin*, 1943, v. 40, 319.] *G. Lapage.*

Duvoir, M. & Brumpt, L.-C. Le traitement des polyglobulies par l'ankylostomose provoquée (à propos de cinq cas). [**The Treatment of Polycythaemia by Administration of Larvae of *Ancylostoma duodenale* and the Consequent Production of Ankylostomiasis. Report upon 5 Subjects thus treated.**] *Ann. Parasit. Humaine et Comparée.* 1944–45, v. 20, No. 1–2, 35–42.

Radiotherapy, the injection of radio-active substances and administration of phenylhydrazine are the only methods known for the treatment of this disease. The authors reared larvae of *Ancylostoma duodenale* by the technique described (faecal culture of the usual type in animal charcoal) and administered 300 to 700 larvae (about 500 larvae is recommended as not being dangerous) by placing them on wet blotting or filter paper which was then applied to the skin of the thigh and allowed to remain there till dry. Penetration of the larvae is indicated in 5 to 10 minutes by itching. The dermatitis produced is described. [See also Duvoir & Brumpt, *Ann. Dermat. et Syph.*, 1942, Feb., p. 97.] The infestation does not, apparently, produce sensitization; reinfestations given to two subjects a year later did not produce any greater reaction. Migration of the larvae to the lungs did not produce recognizable symptoms or radiographical signs (although one subject had retrosternal pain and cough on the 3rd day), but symptoms of duodenitis developed, easily controlled by "extract of opium." Meyer's reaction for the presence of occult blood was positive in three subjects on the 23rd, 30th and 40th days, respectively, but the authors doubt its reputed sensitivity. Melaena and haemorrhage like that experimentally observed in infestations of dogs with *A. caninum* were not seen and this fact is briefly discussed. Eggs of *Ancylostoma* appeared in the stools on the 39th-40th day after infestation. The general condition of the subjects was not altered and they did not look like hookworm subjects. The blood picture is discussed in relation to the hypothesis that the anaemia of ankylostomiasis is due to secondary infection favoured by damage to the mucosa. In one subject there was, in three months, an eosinophilia of 66 per cent. Eosinophilia fell to 10 per cent. by the end of a year; reinfestation then caused a much smaller rise in the number of eosinophils; this is attributed to resistance to infestation, which prevents some larvae from developing.

In 15 days to three weeks, amelioration of the disease was already evident. The headache, vertigo and pains in the lower limbs disappeared. Three subjects showed a slight decrease of arterial blood pressure. This precedes the fall in the number of erythrocytes, which began, on an average, about a month after infestation and fell to a minimum at the third month; it then rose again slowly to become stabilized about the sixth month at a subnormal level, very much lower than its starting point. [In their summary, the authors say that the number of erythrocytes rises, without anthelmintics, to a normal level or slightly above this.] Administration of anthelmintics (not specified) to one subject caused a rise of the number of erythrocytes to 7 millions per cc. and two reinfestations at intervals of one year were necessary to bring the erythrocyte count back to normal. The authors think this is a simple, durable method of treatment (although they do not recommend it for all subjects); it is easy to control; its only inconvenience is the easily-controlled duodenitis; it is not dangerous to the subject or to the community, for the climatic conditions necessary for the development of the larvae do not exist in France. The five subjects were observed for periods varying from three months to five years and another subject is still under observation. [See also Duvoir *et al.* (*Bull. et Mém. Soc. Méd. Hôpit. de Paris*, 1940, Nos. 4, 5, 6, and Duvoir *et al.*, *Le Sang*, 1942, v. 15, 81.] *G. Lapage.*

EINHORN, N. H., MILLER, J. F. & WHITTIER, L. **Ascariasis : Clinical Survey of One Hundred and Twenty-Five Cases of Infection with** *Ascaris lumbricoides* **in Children.** *Amer. J. Dis. Children.* 1945, Apr., v. 69, No. 4, 237–46, 2 figs.

The authors studied 125 subjects, aged between 11 months and 12 years, in the Gorgas Hospital, Ancon, Panama Canal Zone, from Jan. 1, 1941, until Jan. 1, 1944. Co-existing infestations with other nematodes were frequent, but these are excluded from this report. All socio-economic groups are represented among the subjects : 5·6 per cent. were whites, 36·8 per cent. negroes and 57·6 per cent. mestizos [half-castes] (most of whom literally lived " on the soil "). Government communities with minimal overcrowding and excellent sanitation provided 12 per cent. of the subjects ; the cities Colón and City of Panama (in the centre of which there is overcrowding but good sanitation not fully used, and on the outskirts bad sanitation and no street paving) provided 26·4 per cent. of the subjects (this degree of infestation was not expected from these areas, but it is suggested that these subjects lived in areas of poor sanitation, or moved often to such areas from areas of good sanitation or that the addresses given were those of the fathers who lived in areas of good sanitation on account of their work, while the families lived in rural areas) ; rural and semi-rural communities with no sanitation provided 61·6 per cent. of the subjects.

A high incidence in early life is shown by the fact that one girl aged 11 months died of a heavy infestation [see below] (this subject must have been infested at the age of 9 months or earlier) ; 16·8 per cent. were infested before 18 months and 52·8 per cent. before four years. The boys numbered 54·4 per cent. and the girls 45·6 per cent. The authors emphasize the fact that 79·2 per cent. of the subjects were brought to hospital because of diseases other than ascariasis and that in most of the subjects the ascariasis caused either no symptoms or only unimportant ones ; these were worse in the younger children. Only 26 (20·8 per cent.) had symptoms due to ascariasis alone. The commonest co-existing disease was malaria (in 55·2 per cent. of subjects) ; respiratory infections were the next commonest (in 16 per cent.). The most frequent symptoms considered to be due to ascariasis were vomiting (in 22·4 per cent. among whom 10·4 per cent. vomited *Ascaris*) and the passage of *Ascaris* by the bowel (in 22·4 per cent.). Malnutrition was frequent. Other symptoms were abdominal pain (in 8 per cent.), anorexia (in 8·8 per cent.), diarrhoea (in 8·8 per cent.), abdominal distension in two subjects (ascribed to the tuberculosis present as well) and excessive appetite in one subject. There was cough in 5·6 per cent. and fever in 11·2 per cent. and some bronchopneumonia and lobar pneumonia, but it is suggested that these were not due to migration of *Ascaris* larvae ; chest signs were rare and no larvae were found in the sputum. The pallor, circles under the eyes, poor development and mental and physical sluggishness mentioned by other authors as symptoms of ascariasis were not noticed. The authors conclude from their blood examinations and comparison of these with those of 30 children without ascariasis (the results of which were the same), that the subjects with ascariasis were not anaemic, that the number of their white blood cells was normal for this area and that eosinophilia (noted in only 11·2 per cent. of the subjects) was no index of the severity of the infestation. The stools of all subjects contained eggs of *Ascaris*.

Eight subjects were treated with oil of chenopodium, in doses (not specified) reckoned according to the age and preceded and followed by a magnesium citrate purge. Chenopodium failed in two subjects, who were then given hexylresorcinol. Tetrachlorethylene was given to 15 subjects but was not effective. Hexylresorcinol was given to 98 subjects in doses of 0·1 to 0·2 gm

in gelatin capsules (0·1 gm. per year of apparent age), preceded by magnesium citrate on the previous day and followed 24 hours after the hexylresorcinol by the same purge and, in severe infestations, by an enema also. Two courses of hexylresorcinol were given to 11 subjects and three to two subjects. Infrequent vomiting was the only sign of intolerance. After the vermifuge, signs of toxaemia (weakness, lassitude, anorexia) due to absorption of products of the decomposition of the nematodes were often noted. Hexylresorcinol seemed to be the safest and most effective anthelmintic of the three used and the easiest to give. Capsules can be put directly into the oesophagus of young subjects. Its general results were all that could be desired; it does not affect the migratory larvae, but it gave the children a new lease of life. Reinfestation is likely, but, as they grow older, the children seem to suffer less. There can be no adequate therapy until sanitation prevents reinfestation.

Autopsies upon four subjects who died are described in detail. In two of these *Ascaris* was incidental to the primary cause of death. In the other two, death was due to the *Ascaris* infestation. In one of these subjects, aged 2 years, one *Ascaris* was found in the oesophagus, four in the stomach, 79 in the small and large intestine; an *Ascaris* was protruding from the perforated appendix (yet of all the appendices removed from children during the period covered by this report, none contained *Ascaris*); there was generalized peritonitis with ascarids in the peritoneal cavity, diaphragmatic pleurisy and dehydration and emaciation. In the other child, aged 11 months, there were groups of coiled *Ascaris* larvae in both mastoid antra, but without purulent exudate; the right tympanic membrane was perforated. The brain was normal. In the liver there were numerous ascarids in the biliary tract and ducts and in the parenchyma (in cysts with brownish-green necrotic walls containing one to eight parasites which measured 2 to 4 cm. long); it was estimated that there were 150 parasites in the liver. In the gall bladder which contained no bile or mucus, there were 40 ascarids (the longest measuring 10 cm.). Two ascarids were found in the pancreas, one of which protruded from the main pancreatic duct into the duodenum. In the oesophagus there were three ascarids, in the stomach 20, in the duodenum 38 and in the small intestine 181—a total of 242; ulceration and other lesions were absent. The histology of the brain, liver and other organs is described. *G. Lapage.*

SARTORIUS, K. **Intestinal Obstruction due to Round Worms (*Ascaris lumbricoides*) with a Report on Two Cases.** *Clin. Proc.* Cape Town. 1945, June, v. 4, No. 4, 194–9.

CLEARKIN, P. A. **A Note on the Laboratory Diagnosis of Filariasis, resulting from Infection by *Wuchereria bancrofti*.** *Caribbean Med. J.* 1944, v. 6, No. 5, 317–21.

Referring to earlier work upon skin tests and precipitin and complement fixation reactions for the diagnosis of infestations with filariasis, the author says that the skin test has been used as a routine measure for the last 2½ years at the Central Medical Laboratory, Georgetown, British Guiana; this paper records the results. [See also Clearkin, this *Bulletin*, 1944, v. 41, 598.] The antigen was made from *Dirofilaria immitis*, obtained from unwanted dogs by the method here described by the author. The routine now adopted is to try first a 0·2 per cent. extract and, if the test is negative, to try a 0·5 per cent. extract. This procedure detects the less sensitive subjects, who may give negative reactions with extracts weaker than 0·2 per cent. An appreciable number of subjects are phenol-sensitive, so that controls done with the 0·5 per cent. phenol in 0·85 per cent. saline with which the extract is made, are important.

Six out of 35 subjects tested this year gave positive reactions to phenol-saline and the reaction of three of them was as strong as that given to the *Dirofilaria* antigen. The author suggests that merthiolate might be a better preservative. It is important to make the control test first, because even a trace of the extract may cause some degree of reaction in the control. Separate syringes for the phenol-saline and extract are preferable. [The facts disclosed in the Memorandum by Medical Officers' of Health (*Lancet*, 1945, July 28, 116) on the transmission of jaundice by syringes, and by DARMADY and HARDWICK (p. 106) and the Leading Article (p. 111) in the same issue of the *Lancet* fully support the need for great care in the cleansing of syringes, as does the work of others with skin tests of all kinds.] Over 500 skin tests were done by Clearkin, but only 136 recently performed are considered, because the technique of earlier tests varied from that here described. Of these 136, 4-plus positive reactions were obtained in 29, 3-plus in 36, 2-plus in 34 and 1-plus in 23 ; 14 were negative. Two of the 4-plus positives gave reactions of similar magnitude to the control solution, as did one of the 1-plus positives. Three negative patients had only just arrived from North America and were considered to be " non-filarial ". Excluding these six, 26 out of 130 subjects gave 4-plus reactions, 36 gave 3-plus, 34 gave 2-plus and 23 gave 1-plus ; 11 were negative. Two undoubted and three doubtful cases of filariasis failed to react. The percentage of positives was thus 91 per cent. This high sensitivity of the test, is, however, compromised by its lack of specificity to *Wuchereria bancrofti*. Infestations with *Loa loa* and *Onchocerca volvulus*, which may also give positives with the test, can usually be excluded by their clinical signs or the absence of these nematodes from certain areas, *e.g.* British Guiana. A positive skin test in conjunction with clinical symptoms of filariasis in an area in which *W. bancrofti* is known to occur, can be taken as confirmation of the diagnosis of filariasis. But the test may also give positives with *Trichuris* infestations ; a more serious source of error is infestation with *Trichinella spiralis*, especially where this species is endemic or where subclinical trichiniasis is common. On the other hand, subjects with clinical signs of filariasis and giving a positive reaction to *Dirofilaria immitis* antigen have been skin-tested by the author with *Trichinella* antigen and so far no positive reactions have been obtained. *G. Lapage.*

FRANKS, M. B. & STOLL, N. R. **The Isolation of Microfilariae from Blood for Use as Antigen.** *J. Parasitology*. 1945, June, v. 31, No. 3, 158–62, 5 figs.

The aim of the authors was to free the microfilarial larvae of *Dirofilaria immitis* of the dog and at the same time to keep enough of them viable to make it possible to prepare antigen from them. The best results were obtained by the following method :—

The work was done in as cold conditions as possible, *i.e.* the diluting fluids were refrigerated and the blood and its containers were kept in iced water. All procedures were sterile. Blood was taken into a flask containing 5 per cent. of sodium citrate in saline till the citrate and blood were in the proportion of 1 part of citrate to 4 parts of blood. This mixture was centrifuged for 30 minutes at 2,500 r.p.m. and the supernatant fluid was removed for separate processing. The white blood cell layer was drawn off and discarded. The packed red blood cells and microfilarial larvae were brought to the original blood volume with a mixture of 1 part of 3·8 per cent. sodium citrate and 4 parts of normal saline. The red blood cells were then haemolysed with saponin, about 1 cc. of a 15 per cent. solution of saponin in physiological saline being needed for each 15 cc. of the original blood volume. Excess of saponin above this amount killed many of the microfilarial larvae ; but in the solution stated the larvae were seen to be motile. The haemolysed blood was centrifuged

for 30 minutes at 2,500 r.p.m. and the supernatant fluid, which was practically free from the larvae, was discarded. The sediment of red blood cells and larvae was washed two or three times with sodium-citrate-saline to remove as much as possible of the saponin, the supernatant fluid being discarded each time. Most of the larvae remained in the red blood cell stroma and it was difficult to release them from this. They were best released by adding saline-citrate and shaking vigorously to free the larvae and then centrifuging at a high speed (not stated) in a rubber-capped 250 cc. Pyrex centrifuge bottle for 30 to 60 seconds to bring down the red blood cell stroma. The supernatant fluid was then again centrifuged to bring down the larvae in it. This process was repeated several times. A dozen washings of the stroma by this method were needed to give a good yield of larvae, but concentrations of larvae 200 times or more greater than that found in the original blood were obtained. The larvae were then washed in Tyrode solution and stored in diluted plasma or serum or Tyrode solution. They were best stored in an Erlenmayer flask, which enables them to disperse, and refrigerated. They will remain viable thus for two weeks or longer. In order to obtain 80 per cent. or more of microfilarial larvae from a litre of blood, 48 to 72 man-hours of continuous work were needed ; the work cannot stop after the haemolysis with saponin has been effected.

To dry the microfilariae, they were first washed in saline several times. As much as possible of the last washing fluid was drawn off and the larvae were put into a small amount of distilled water in a tube of known weight, and lyophilized. They dried as a fluffy, white, talc-like substance. There were some 400 to 500 million larvae in each gram of dry weight. This material was stored in desiccator at room temperature. When it was again wetted, the dry, twisted sticks of larvae filled out and became almost life-like. The authors could not adequately test the material serologically, but they made an initial dilution of 1 in 100 in saline on a dry-weight basis, by grinding up the larvae, adding saline and, after keeping overnight, centrifuging and using the supernatant fluid as antigen. Precipitin tests were done on 20 dogs with varying numbers of microfilariae in the blood, on eight men with filariasis, and on controls. All the controls were negative. The dogs gave positive reactions at dry-weight dilutions of 1 in 1,600 to 1 in 25,000, but many dogs with large numbers of circulating microfilariae showed low titres or negative reactions. The men responded to the same range of dilutions. Parallel tests done with antigen obtained from dried adult *D. immitis* gave similar results, but at a slightly lower titre. The microfilarial larvae are difficult to disintegrate ; many were not broken up even by liquid-air freezing or the TenBroëck grinder, so that the extract used was probably not as strong as the larvae could furnish. The authors remark that, since their paper was written, they have seen the paper by Oliver-González and Bercovitz [this *Bulletin*, 1945, v. 42, 219], who also used saponin for the preparation of an antigen from the microfilariae of *Wuchereria bancrofti*. *G. Lapage.*

Scott, O. K., Richards, C. S. & Seaman, E. A. **Experimental Infection of Southern California Mosquitoes with** *Wuchereria bancrofti*. *J. Parasitology*. 1945, June, v. 31, No. 3, 195–7, 2 figs.

Although microfilariae have practically never been found in the blood of soldiers who have returned from the South Pacific Islands with filariasis, it is interesting to know whether mosquitoes in hitherto uninfected parts of the U.S.A. could convey the infection ; the authors therefore made experiments by feeding all the common mosquitoes of the San Diego area (California) on a negro from the Virgin Islands who had microfilariae in his blood. The results are shown in the table :—

Mosquito	Dissected on death before 17th day after feeding		Dissected alive on 17th day after feeding	
	Infected	Not infected	Infected	Not infected
Culex erythrothorax	14	11	18*	12
C. quinquefasciatus (*C. fatigans*) ...	4	2	17†	3
C. tarsalis	0	0	1‡	2
Aëdes taeniorhynchus	10	28	0	4
Anopheles maculipennis freeborni...	0	1	0	6
A. pseudopunctipennis	0	1	0	0

* 8 had larvae in the proboscis. † 13 had larvae in the proboscis.
‡ 1 had larvae in the proboscis.

Culex stigmatosoma, *Culiseta inornata*, and *Culiseta incidens* refused to feed, and only one specimen of *Anopheles pseudopunctipennis* fed.

The authors conclude that *Culex quinquefasciatus* (*C. fatigans*), *C. erythrothorax* and probably *C. tarsalis* would be vectors of the disease if persons with microfilariae in their blood were present in South California. *J. F. Corson.*

Hu, S. M. K. **Studies on the Susceptibility of Shanghai Mosquitoes to Experimental Infection with *Microfilaria malayi* Brug. VII.** *Culex fuscanus* **Wiedemann.** *Chinese Med. J.* Washington. 1944, July-Sept., v. 62, No. 3, 255–9.

"1. The susceptibility of *Culex fuscanus* to infection with *Microfilaria malayi* has been confirmed.

"2. Of 68 *Culex fuscanus* fed on two cases of *Microfilaria malayi* infection, 2 or 2·9 per cent. were found with mature filarial larvae in them.

"3. Fourteen of the mosquitoes were found with only dead encapsulated microfilarial form larvae, while the remaining 53 mosquitoes were negative for any filarial larva.

"4. *Culex fuscanus* is not likely to play a significant role in the transmission of *Microfilaria malayi* infection in the lower Yangtze region because in this part of the country it seldom enters houses or feeds on man."

Jaffe, H. L. **Evaluation of Roentgen Therapy in Filariasis.** *Amer. J. Roentgenol. & Rad. Therapy.* 1945, May, v. 53, 483. [Summary taken from *J. Amer. Med. Ass.* 1945, Aug. 4, v. 128, No. 14, 1049.]

Jaffe evaluates the results of roentgen therapy in filariasis by comparing the course of the disease in a group of 50 patients treated by roentgen rays with that of an untreated group of the same number. Three months after treatment the course of filariasis was similar in the irradiated and in the untreated patients. Several patients derived benefit from roentgen therapy in that some glandular swellings were reduced in size and were rendered less painful. No harmful effects were observed as a result of this roentgen treatment. Total body irradiation offers no advantage over local roentgen therapy and at times does not appear to be as effective in relieving the pain of enlarged glands or in reducing their size. Roentgen therapy did not influence the frequency, duration or severity of recurrent attacks after periods of remission. Several patients who complained of a pleuritic type of pain presented lesions of a

transitory and migrating type of chronic pneumonitis affecting one or both lungs. These patients were afebrile and showed a normal white blood cell count.

War Medicine, Chicago. 1945, June, v. 7, No. 6, 377–84, 2 figs. **Filariasis (*Wuchereria*), with special reference to Early Stages.** War Department Technical Bulletin. TB Med 142.

Vargas, L. Notas sobre la oncocerciasis. I. Consideraciones sobre la población de simúlidos adultos. [**Notes on Onchocerciasis. I. Considerations on Adult Simuliid Populations.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1945, Mar., v. 6, No. 1, 51–9. English summary.

" Data concerning the black-fly population are necessary to understand the epidemiological facts in onchocerciasis. Data obtained by the use of light traps are analysed as well as those reached by the use of capture on human baits. To get better information on the problem of the population it is recommended to test human baited traps."

Vargas, L. Notas sobre la oncocerciasis. II. El factor luz y los sumúlidos Adultos. [**Notes on Onchocerciasis. II. The Effect of Light on Adult Simuliidae.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1945, Mar., v. 6, No. 1, 61–6. English summary.

" The black flies are strongly phototropic positive. Ultraviolet light attracts them remarkably ; on the contrary, red light or darkness makes them motionless. We applied this observation, maintaining females without any other food up to six days, but as in nature the females looking for blood have already been fertilized, at the end of this period they show mature eggs, and as they are unable to lay them in captivity, die in the 5th or 6th day after the blood meal. For the study of the transmission of nemathelminthes or protozoa by black flies the preservation of females in the dark may be useful."

Vargas, L. Notas sobre la oncocerciasis. III. Algunos factores que afectan la fijación de las larvas de simúlidos. [**Notes on Onchocerciasis. III. Factors affecting the Fixation of Larvae of Simuliidae.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1945, Mar., v. 6, No. 1, 67–70. English summary.

" Larvae of the black-flies *S. metallicum* and *S. callidum* are easily dislodged from their breedings by swift running waters or by water carrying fine debris, grains of gravel, etc. Larvae fixed in the lower surface of leaves, etc., are better protected and are more apt to remain there."

Mukerji, A. K. & Bhaduri, N. V. **Gnathostome Infection of the Eye.** *Indian Med. Gaz.* 1945, Mar., v. 80, No. 3, 126–8, 2 figs. (1 on pl.) [10 refs.]

Full-grown adults and larvae of *Gnathostoma* have been recorded from man since 1889. Up to 1934 a total of 21 cases have been listed [see Prommas and Daengsvang, this *Bulletin*, 1934, v. 31, 801] and during the last ten years three more. Two of these latter were from Bengal (from which province three cases were previously known) and one was from Siam. In India human gnathostomatosis is known so far only in Bengal. In the earlier Bengal cases the worms were found in cutaneous nodes, superficial tumours and breast

abscesses ; in the Siamese case the worm was found in an abdominal tumour removed surgically. The case here reported is the sixth from Bengal and is the first in which the worm has been found in the eye.

The subject was a Hindu male, aged 26, who had never been out of Bengal and had never eaten raw or dried fish, although he had bathed in a tank. Before coming to hospital he complained of a dull ache in the left side of the nose, extending to the left frontal region, followed by swelling of the left cheek and left lower eyelid extending up to the roots of the hair, so that the left eye could not be opened. Orbital cellulitis was found, but vision was at first normal. Two days later only movements of the hand were recognized and there were haemorrhages in the retina and vitreous humour. Three days later there was severe iritis with small grey nodules on the iris. These nodules disappeared, but later iritis reappeared with one large grey nodule on the iris and also a pigmented nodule. Both these disappeared and later another pigmented nodule appeared which was seen to move ; the next day wavy movements were seen in it and the worm was removed from the angle of the anterior chamber of the eye. The eye quickly became normal again.

The worm was 3 to 5 mm. long by 0·41 mm. at its broadest (about its middle). The head bulb was 0·116 mm. long by 0·25 mm. broad. On the head bulb there were four rows of spines, with 40 spines in each row. Spines continued back on the transverse ridges on the body to the extreme posterior end of the worm, becoming gradually smaller from before backwards. There were four cervical sacs in the oesophageal region, but no genitalia were seen. The worm most resembled the one described by MAPLESTONE [this *Bulletin*, 1930, v. 27, 984]. Because the spines continued almost to the posterior end the authors do not think this was an immature specimen of *G. spinigerum* ; it was probably not *G. hispidum*, because the head spines were not simple. They are inclined to think it was a specimen of the new species described by Maplestone [*loc. cit.*].

In man both larvae and adults have been found, so that man can be an accidental definitive host ; the natural hosts are the cat and the dog. No adult worm has yet been found in fish, but man is probably infested by eating infested *Cyclops* or fish. In Bengal, infestation by eating fish is not likely, because fish are always cooked there, and dried fish is not usually eaten raw. There is as yet no proof that the larvae acquired by man ever become mature in him. Because man is an unsuitable host, the worm wanders in him and causes symptoms. *G. Lapage.*

PETERSEN, M. C. & FAHEY, J. **Oxyuriasis : Simplified Method of Diagnosis with Glass Slide : Incidence in a Minnesota State Hospital : Result of Treatment with Gentian Violet.** *J. Lab. & Clin. Med.* 1945, Mar., v. 30, No. 3, 259–61.

At Willmar State Hospital, Minnesota, the authors noted 4 per cent. of eosinophils in differential white blood cell counts and a routine search usually revealed *Enterobius*. A survey of the whole institution was therefore undertaken between September 1940, and July 1942. The institution is built on the cottage plan. Each cottage accommodates about 100 subjects and frequent transfers of patients from one cottage to another occur. The total capacity of the cottages is 1,450 beds. The majority of the patients are chronic mental cases transferred from other hospitals ; most of these have been in hospital more than a year and many more than ten years. A minority of patients are drug-addicts and alcoholics admitted directly and remaining for only two to four months.

The authors first used the NIH swab [HALL, this *Bulletin*, 1937, v. 34, 878]. They then tried the cellophane tape used by JACOBS (*J. Pediatrics*, 1942, v. 21, 497); this was as efficient as the NIH swab, but was too slow. They then used glass slides with smooth edges and found these as accurate and much faster than the NIH swab or the cellophane tape. At one end of the slide a number was scratched or etched for identification of the slide and of its exposed side. Slides were put in metal holders so that they did not touch each other. They were cleaned and used repeatedly. Subjects were examined between midnight and 4 a.m. and no baths were allowed the night before examination. The subject was asked to bend over and to strain slightly. "The examiner would hold the marked end of the slide and press the other end against the anal mucosa and muco-cutaneous junction in such a manner that one edge of the slide would be toward the centre of the anus. The slide would then be lifted and the opposite edge pressed against the opposite anal margin." Only the marked side of the slide was exposed. The moisture of the anal margin was enough to make the eggs of *Enterobius* adhere. The eggs were usually found along the edges of the slide. Slides could be kept several days before examination. All patients in each cottage were examined the same night. Subjects who were negative were re-examined until all other subjects were negative; sometimes 18 such examination were made. "Fairly frequently" the authors found large numbers of eggs on slides from subjects who had been previously repeatedly free from eggs.

In all, 1,871 subjects were examined. Of these 1,100 (59 per cent.) were infested; 72 per cent. of chronic mental subjects, and 1 per cent. of inebriates were infested, but none of the employees, although two employees had previously been treated for enterobiasis. A table gives the incidence. It shows a "decidedly higher" incidence among males (*e.g.* 11 per cent. of 83 female persons in cottage 3, 88 per cent. of 103 males in cottage 4, 40 per cent. of 100 females in cottage 5 and 95 per cent. of 106 males in cottage 6). The incidence was highest among the "disturbed and deteriorated" subjects; it was lower among subjects received by transfer from other hospitals, perhaps because they had not been so long in hospital as the others.

All the infested subjects were treated with gentian violet. Two enteric-coated tablets, each containing half a grain (0·032 gm.) of gentian violet, were given by the mouth twice a day after meals for eight days; after a rest of eight days, this course was repeated; after a second rest for eight days a third course was given. A total of 48 grains (3·1 gm.) was thus given over 40 days. Toxic symptoms were rare in males, but fairly frequent in females. Some subjects lost weight during treatment, others showed anorexia, nausea, vomiting, mild abdominal pain and diarrhoea. The symptoms disappeared when treatment was discontinued for a few days, and the treatment was then resumed. To test the efficacy of gentian violet, six examinations were made during four weeks. After the first course of gentian violet, eggs of *Enterobius* were found in 98 (9 per cent. of subjects infested before treatment began); after the second course they were found in 11 (1 per cent.) and after the third course in 2 (0·2 per cent.). One subject was passing eggs after five courses. In two cottages 208 subjects were examined ten months after treatment. Of these, 31 (29 per cent.) in cottage 6, and 46 (45 per cent.) in cottage 12 (*i.e.* 37 per cent. of 208 subjects) were then found to be infested.

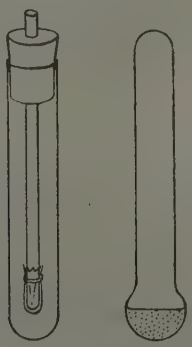
[For a summary of the long series of studies of enterobiasis in the United States on the diagnosis and treatment (with gentian violet, hexylresorcinol, tetrachlorethylene and santonin) of enterobiasis, see CRAM, this *Bulletin*, 1943, v. 40, 618; for treatment with phenothiazine, see SISK, *ibid.*, 927, BERCOVITZ, *et al.*, *ibid.*, 929, MOST, *ibid.*, 930, and the bibliography appended to the last-named abstract. MILLER and ALLEN, *ibid.*, 1942, v. 39, 781, compared the

effects on *Enterobius* of phenothiazine and gentian violet. In the abstract quoted the dose of gentian violet given by these authors was given in error (see this *Bulletin*, 1944, v. 41, 306) in grammes instead of grains. For some references to the diagnosis of enterobiasis see the two abstracts next following below]. *G. Lapage.*

Schüffner, W. & Swellengrebel, N. H. Eine zweizeitige Methode zum Nachweis von Oxyuris-Eiern. Ihre Leistung gegenüber dem amerikanischen NIH-Wischer. [**A Two-Stage Method for the Detection of Oxyuris Eggs. Its Efficacy compared with that of the American NIH Swab.**] *Zent. f. Bakt.* I Abt. Orig. 1943, Dec. 11, v. 151, No. 1, 71–80, 3 figs. [11 refs.]

The authors worked in Amsterdam. They found that after the perianal skin had been given a brief wash with water, 99 per cent. of the *Enterobius* eggs on it were washed off and only 1 per cent. could be recovered from within the anal sphincter, although they found eggs adhering to the surface of formed stools. When a subject who had an average of 400 eggs (in six preparations) on the perianal skin was washed, an average of 0·25 per cent. of the eggs were recovered. This result was not expected, because the stickiness of *Enterobius* eggs is always so much emphasized in the literature; but it suggests that simple washing can be an effective means of control of the spread of *Enterobius*. Observation of the process of egg-laying by *Enterobius* showed that the eggs are laid in a stream; a dense cluster is laid in a few minutes and movement of the nematode during egg-laying, which precedes the death of the female, is feeble, so that the eggs are not widely distributed by the nematode. The whole contents of the uterus are laid; the authors quote literature which indicates that some ten to thirteen thousand eggs are deposited. The eggs are laid in clusters (photographs of these are given).

With the implements generally used: match stalks, the cotton wool swab of Heubner (*Jahresber. kinderheilk.*, 1922, v. 96, I) the scraper of Japha [this *Bulletin*, 1925, v. 22, 491] and the NIH swab of Hall [this *Bulletin*, 1937, v. 34, 878], only a part of the perianal skin is wiped or scraped and it



NIH Cellophane Swab (left) and Glass Pestle (right) for detecting *Enterobius* Eggs. [¾ actual size.]

[Reproduced from *Zentralblatt für Bakteriologie.*]

depends on chance whether eggs are taken up or not, especially when infestations are light. To avoid this source of error, the authors tried the method of breaking up the egg clusters and distributing them over the perianal skin.

First they massaged this skin with the finger and water for 10–15 seconds, thus making an emulsion containing squamous cells, mucus, sweat and faecal matter. Examinations of this emulsion being favourable, they then used for the same purpose a glass pestle made from 10 cm. of thick-walled glass tubing, the end of which was blown into a globe about $1\frac{3}{4}$ cm. in diameter; the lower half of this globe was ground rough, so that it could exert sufficient friction to dislodge material between the perianal folds and on the perianal skin (stage 1). The pestle was moistened with water before use and the emulsion made with it was transferred to a drop of water on a slide and examined under a cover-glass (stage 2). The emulsion can also be spread over a slide and dried and then is more readily transportable than the NIH swab.

The effects of drying on the eggs must be considered. When one such dried drop was incubated at 37°C. in pepsin solution for some hours, larvae emerged from the eggs in it after eight days and six weeks; after eight weeks this happened only in some eggs and after 13 weeks only in isolated eggs [*cf.* HELLER, this *Bulletin*, 1945, v. 42, 579, who found that sensitivity of the eggs to drying depends upon the stage of development of the embryo and on its cuticular covering and concluded that drying and ventilation of rooms will kill most of the eggs and reduce the degree of infestations]. By this method of drying drops, eggs in dust were found to be viable (but see also the following abstract). These dried drops can be examined by wetting them again with water or dilute NaOH; but examination in cedarwood oil is the method of choice for *Enterobius* eggs, although it is not satisfactory for the eggs of *Ancylostoma*, because faecal smears are thicker than these dried drops and are not cleared sufficiently by the oil. It is better to ring the dried drops with ink so that they can be located after they are cleared. The eggs are not cleared and look rather like air bubbles. Drops thus cleared remain unchanged for weeks. Liquid paraffin can also be used; it is less effective, but is cheaper and easier to clean off.

Tests of this method showed that, when the emulsion samples taken with the pestle were examined in water, the first drop taken contained about one-third of all the eggs on the pestle and the second drop about the same or even a larger number. When drops were taken one after another (the pestle, being washed after each, was put on a slide and then recharged with emulsion, so that two-thirds of the eggs taken up each time were lost) the drops were negative after 30 such samples had been taken. In spite of the washing of the pestle the numbers of eggs in the first six drops were not greatly different, although the size of the drops was judged only by the naked eye, so that their contents were not strictly comparable.

The authors claim that this method requires only about one-third or less of the time taken by the NIH swab. They examined 50 subjects with the NIH swab in 578 minutes (about 9 hours) and the same 50 in 172 minutes by the pestle (about 3 hours). This included the counting of the eggs, which is not necessary for diagnosis. They claim that the NIH swab takes three to six times as long as the pestle does, when the number of eggs present is constant. Samples taken from negative subjects must be searched throughout their extent, but, in 37 examinations, the time taken to do this was 11 minutes with the NIH swab and $2\frac{1}{2}$ minutes with the pestle drops. The watery medium used to examine the NIH cellophane swabs takes longer to examine and oil cannot clear cellophane.

Whatever instruments are used they must be cleaned after each examination. The authors think that the directions for cleaning the NIH swab and its containers [FOLAN, this *Bulletin*, 1940, v. 37, 300] are excessively stringent. Cleansing of the pestle is very simple. Experiments showed that washing is enough, because the finely-ground emulsion, which has not dried on the pestle,

adheres only feebly to the glass. The authors scour the pestle head and then repeat this in a vessel containing "strong disinfectant" and a cotton-wool pad on which the pestle is left standing until its turn for use comes round again. They always used two pestles.

Tables give the results obtained with the pestle and the NIH swab.

For the examination of 50 subjects the NIH swab was always used first; this gave it an advantage. Yet with it only 37 of the 50 subjects were positive, while all 50 were positive with the pestle. In addition the pestle recovered nearly four times as many eggs (3,372 as compared with 931). Examination of one subject showed, however, that the NIH swab recovered more eggs than the pestle in the proportion of 201 to 2 (*cf.* one similar instance in the succeeding abstract below). Probably the NIH swab, in this instance, chanced to take up most of the eggs deposited in clusters. When 12 children were examined first with the NIH swab and then, after making an emulsion on the perianal skin, with the pestle, the first eight were negative at the first examination with the NIH swab, while only two of these were negative with the pestle, so that the pestle reduced the number of re-examinations required. The pestle also recovered more eggs from these children. The authors claim that the pestle detects eggs when the infestation is so light that the NIH swab fails to do so. Its use does not exclude the necessity for re-examinations, but fewer than the seven to ten re-examinations recommended by those who have used the NIH swab are necessary. The authors showed that, when schoolchildren take baths only once a week, the eggs adhere to them all the week until the bath removes them. The pestle is simpler to clean and to manage and the slides and covers are more easily put back into use. It does not rasp or scratch the skin, whereas the sharp cellophane folds of the NIH swab may do this.

G. Lapage.

Schüffner, W. & Swellengrebel, N. H. Der Nachweis von Oxyuren-Eiern am After, im Nagelschmutz und im Zimmerstaub. II. Mitteilung. [**On the Detection of *Oxyuris* Eggs on the Perianal Region, in the Nail-Dirt and in the Dust of Rooms.**] *Zent. f. Bakt.* I. Abt. Orig. 1944, Jan. 28, v. 151, No. 2, 114–22, 1 fig.

In this paper the authors give further evidence which demonstrates, in their opinion, the superiority of the pestle devised by them [above] over the NIH swab.

Five children were examined first with the NIH swab and all were negative. Then they were examined with the pestle and all were found to be positive (26 eggs found). A third examination of them with the NIH swab, which now operated on the faecal emulsion made for the pestle, detected three positives (four eggs found). The authors claim that this indicates that the preparation of the faecal emulsion, which breaks up the egg clusters and distributes the eggs more uniformly over the perianal skin, improves the performance of the NIH swab.

When 13 other children were examined by the same method, all were positive at all three examinations, but the second NIH swab recovered far fewer eggs than the pestle (first NIH swab, 463 eggs, pestle 3,672 eggs, second NIH swab 905 eggs). Examination of 4 other children revealed no special advantage of the pestle. When, however, two other children were later examined in the same way the first NIH swab recovered more eggs than the pestle (*cf.* the similar instance in the abstract immediately above). Examination of 123 children, aged 2 to 4 years, with the pestle showed that 81 per cent. were positive. Studying the numbers of positives recorded after successive examinations, the authors found that 99 per cent. of 146 children aged 5–6 years were positive.

at the fourth successive daily examination and they compare this result with the record of Sawitz *et al.* [this *Bulletin*, 1940, v. 37, 62], who found that 88 per cent. of 131 children aged 6–14 years bearing an infestation similar in degree to that studied by Schüffner and Swellengrebel, were positive at the fourth examination [with the NIH swab] at intervals of one to two days.

Discussing the number of eggs to be found in the finger-nail-dirt, the authors quote Wilhelmi and Quast [this *Bulletin*, 1925, v. 22, 884], who found *Enterobius* eggs in the nail-dirt of 60·4 per cent. of the children examined, a figure which was near the actual incidence of the infestation in these children. Wilhelmi and Quast therefore suggested that examination of nail-dirt could replace examination of the perianal region. Schüffner and Swellengrebel found, however, that examination of the nail-dirt detected little more than one-third of the actual infestation (95 per cent.) in the children whom they examined and that to obtain this figure three examinations were required. Examination of nail-dirt cannot, therefore, replace examination of the perianal region—not at least in Amsterdam, where children are mostly protected at night by pyjamas. But study of the nail-dirt has epidemiological value, although repeated examinations of it are necessary. The authors, like Wilhelmi and Quast, moistened the finger-nail region in 1 per cent. NaOH, but then removed the nail dirt with match-stalks or with a nail-cleaner (not with the cotton-wool used by Wilhelmi and Quast, to which an unknown number of eggs may adhere) and put it all in a drop of water on a slide ; after drying, it was examined in cedarwood oil or liquid paraffin. The authors concluded that the ring finger can be ignored without detriment to the results.

Some of the literature on the distribution of the eggs in house-dust is discussed. The authors obtained poor results with the method of Nolan and Reardon [this *Bulletin*, 1939, v. 36, 845] who obtained samples of dust with a moist brush and examined them in 1 per cent. NaOH. The authors preferred a floatation method. Dust was either swept up or obtained with a moist brush and filtered through phosphor-bronze gauze with a mesh of about 70 microns. Eggs in t were then floated up in solutions of either NaCl (sp. gr. 1·13), zinc sulphate (sp. gr. 1·33) or zinc chloride (sp. gr. 1·7). The authors preferred zinc chloride, but the heavier salts bring up detritus which may obscure the eggs [see literature referred to below]. Eggs were floated up in small tubes or cylinders with a cover-glass on the top. The authors are convinced that no eggs are lost by removal of this cover for examination. They watched the rise and fall of the eggs in the solutions used. Some eggs may adhere to the sides of the floatation cylinders ; others may adhere to heavy particles which sink and draw the eggs to the bottom. The use of the glass cover is better than the wire loop recommended by Kofoid and Barber [this *Bulletin*, 1919, v. 13, 219]. In zinc chloride (sp. gr. 1·7) the eggs rose at a rate of 1 mm. in 45 seconds ; in water they sank at a rate of 1 mm. in 15 seconds. To obtain all eggs the cover must remain on for ¾ hour. Eggs eventually sink again, but were still at the top after 48 hours. Schuchmann and Kieffer (*Berlin. Tierärzt. Woch.*, 1922, p. 220) used sodium waterglass 1 part, water 2 parts, for floatation and claimed results similar to those obtained with $ZnSO_4$. Schüffner and Swellengrebel, working with 1 part of waterglass to 1 part of water, found it troublesome to use and less efficient than NaCl ; it also spoils glassware. They also tried potassium lactate (sp. gr. 1·33), potassium acetate (sp. gr. 1·26) and calcium chloride (sp. gr. 1·25), but all these were inferior ; the specific gravity is, therefore, not the only factor concerned.

Tables give the numbers of eggs obtained from the dust of various parts of schools in Amsterdam. An "astounding" number of eggs was recovered from the dust of closets, where the dust had been undisturbed for weeks on

the window fastenings ; large numbers were also found in the dining rooms, in which the children remained for only a short time. The authors concluded that the height of the surface from which dust is taken (*e.g.* the top of a table or high cupboard) has no significance, because the eggs are blown about everywhere. Most of the eggs found in dust seemed, however, to be empty. Some hatched out embryos, but the authors were not convinced that eggs found in dust can develop into adult worms after they have been swallowed. HELLER [this *Bulletin*, 1945, v. 42, 579] quotes the conclusion of NOLAN and REARDON [*loc. cit.*] that 90 per cent. of eggs found in dust are not viable.

[With reference to the three preceding abstracts the following references may be useful : MAZZOTTI and OSORIO (this *Bulletin*, 1943, v. 40, 617) compare the results obtained with the Graham and the NIH swab ; KUITUNEN-EKBAUM (*ibid.*, 1942, v. 39, 780) compares the value of the NIH, the Graham and the Frosst cellophane swabs ; VON HOFE (*ibid.*, 1944, v. 41, 958) describes his use of adhesive Scotch tape ; PODYAPOLSKAYA (*ibid.*, 1944, v. 41, 301) refers to the wide use in Russia of the examination of scrapings of the perianal skin for the diagnosis of enterobiasis and adapts it to the detection of eggs of *Taenia* ; MAZZOTTI (*ibid.*, 1945, v. 42, 134, 398) also applies it to the detection of eggs of *Taenia*.

For further discussions of methods of floating up eggs of various species of nematodes and for reference to the vast literature on this subject, see the following abstracts : GORDON and WHITLOCK (1939, *J. Counc. for Sci. and Ind. Res.*, Australia, v. 12, 50) who describe their egg-counting slide for use with saturated solutions of NaCl, which avoids most of the difficulties discussed by Schüffner and Swellengrebel above and is now widely used ; it is briefly compared with the slide devised by WILKINS (this *Bulletin*, 1943, v. 40, 67) ; SAWITZ (this *Bulletin*, 1942, v. 39, 771) discusses the buoyancy in NaCl and $ZnSO_4$ of the eggs of *Enterobius* and some other species of nematodes ; KAUTZ (*Amer. J. Vet. Res.*, 1941, v. 2, 95) compares the merits of NaCl, sugar, $ZnSO_4$, $MgSO_4$ and sodium nitrate ; OTTO *et al.* (this *Bulletin*, 1941, v. 38, 473) describe a simplified $ZnSO_4$ floatation method ; FAUST *et al.* (*ibid.*, 1940, v. 37, 62) discuss the use of $ZnSO_4$; EIGENFELD and SCHLESINGER (*ibid.*, 1944, v. 41, 496) describe a floatation tube designed to facilitate collection of the top layer of fluid ; and LANE (*ibid.*, 1940, v. 37, 477) discusses his well known centrifugal floatation method.] *G. Lapage.*

MAZZOTTI, L. Investigación sobre oxiuriasis en 1120 niños residentes en regiones tropicale de México. [*Enterobius* **Infection in 1,120 Children in Tropical Mexico.**] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1945, Mar., v. 6, No. 1, 37–40. English summary (3 lines).

HARRELL, G. T. & HORNE, S. F. **Trichinella Skin Tests in Tuberculosis Sanatoriums, Hospitals for Mental Diseases, and General Hospitals. A Comparison of the Results in Tuberculous and Non-tuberculous Patients.** *Amer. J. Trop. Med.* 1945, Jan., v. 25, No. 1, 51–8, 2 figs.

This paper is reviewed in *Bulletin of Hygiene*, 1945, v. 20, 469.

DEFICIENCY DISEASES.

ELLINGER, P. & BENESCH, R. **Nicotinamide Methochloride Elimination Tests on Normal and Nicotinamide-Deficient Persons. With a clinical addendum by** S. W. HARDWICK. *Lancet.* 1945, Aug. 18, 197–9. [35 refs.]

"The development of a satisfactory saturation test for the assessment of the nicotinamide or nicotinic acid state of the human body has proved difficult."

The authors, after giving a most useful summary of the work of others in this field, give details of elimination tests carried out on 12 patients believed on clinical grounds to be suffering from nicotinamide deficiencies, with clinical case notes, and on seven normal persons. They say " It should be stressed that the work reported here is of a preliminary nature and that no general conclusions can be drawn before considerably more material has been collected." Subject to a number of qualifications they believe " it can be stated with some confidence that the nicotinamide methochloride elimination test described can yield useful information on the nicotinamide status of the human organism."

All those interested must read the original paper. *H. S. Stannus.*

Chu, H. I., Kuo, P. T. & Chang, K. P. **Blood and Urinary Nicotinic Acid in Normal Chinese, Pellagra and various Pathological Conditions.** *Chinese Med. J.* Washington. 1944, July–Sept., v. 62, No. 3, 231–45. [45 refs.]

Hou, H. C. & Dju, M. Y. **Urinary Excretion of Nicotinic Acid among Normal Chinese, Pellagrins and other Patients.** *Chinese Med. J.* Washington. 1944, July–Sept., v. 62, No. 3, 246–54.

Earle, K. V. **Ariboflavinosis in Northern Peru.** *J. Trop. Med. & Hyg.* 1945, Feb.–Mar., v. 48, No. 1, 10–11. [13 refs.]

The author examined, for indications of ariboflavinosis, 403 patients in hospital (admitted for various conditions not necessarily connected with nutritional deficiency) in Peru. The manifestations (and the percentages in which they were found) were as follows :—Angular stomatitis 10·19 per cent., lingual alterations 5·1 per cent., naso-labial seborrhoea 12·77 per cent., seborrhoea of the ears 3·19 per cent., facial comedones 15·9 per cent. The rates were higher in pregnant or parturient than in non-pregnant women. Associated avitaminoses were common, and are tabulated. *Charles Wilcocks.*

DERMATOLOGY AND FUNGOUS DISEASES.

Varela, G., Olarte, J. & Castro Estrada, S. **The Kahn Triple Quantitative Verification Technique in the Serology of Mal Del Pinto (Pinta).** *J. Lab. & Clin. Med.* 1945, Mar., v. 30, No. 3, 270–72. [10 refs.]

There is an old saying that " the best things come in small parcels." This small article is of much importance, for it is an account, most succinctly expressed, of an intensive study to determine the value of the Kahn test in mal del pinto. Just upon 20 years ago Menk found that the sera of pinta patients in many cases gave a positive Wassermann reaction, he gave 74·5 per cent. as the figure. Others have confirmed this and, more recently, in 1940 León y Blanco showed that in 87·5 per cent. of cases with generalized disease the Wassermann, Kahn, and Müller tests were positive and, in the late stages, as many as 97 per cent. [This author had found the Wassermann and Kahn reactions negative in the primary stage, see this *Bulletin*, 1941, v. 38, 91.]

Kahn, in 1942–3, developed his triple quantitative technique which he believed to be specific for syphilis. The present authors have tested this with sera from pinta patients, after carrying out the standard Kahn test in each case. They used three quantitative procedures, *viz.*, serial dilutions with distilled water, and dilutions with 0·9 per cent. and with 2·5 per cent. saline, and Difco antigen. The standard test was also carried out on the globulin

and pseudo-globulin fractions of the sera in several cases. The results, presented in a table are very instructive. The standard test was found positive for both fractions, and the intensity of the triple quantitative technique increased almost *pari passu* with increase in the concentration of the saline. For details the table, itself must be consulted. The sera were from patients with all types of pinta, white, blue, red and brown. *H. Harold Scott.*

SILVA, F. Achado do *Treponema herrejoni* (Leon y Blanco, 1938) num caso de purú-purú ou pinta observado na Bahia. [**Finding of** *Spirochaeta herrejoni* **in a Case of Pinta in Bahia.**] *Brasil-Medico.* 1945, Apr. 21 & 28, v. 59, Nos. 16 & 17, 155–8, 7 figs.

The author takes the opportunity of a patient who came to him in October 1944, with typical pinta lesions of hands and feet, to give notes of three other cases which he had seen but whose accounts he had not published. One was a man of 56 years, seen in April 1941 ; another a woman of 25, in August of the same year, and a woman of 58 years, in September 1943 ; the fourth was a man of 19 years, seen in October 1944. In all four the Wassermann reaction was strongly positive ; spirochaetes were looked for in all, but were seen in the last only, in fluid exuding from small incisions in the skin of the hands.
H. Harold Scott.

HEAT STROKE AND ALLIED CONDITIONS.

BRUNT, D. **Climate and Human Comfort.** *Nature.* 1945, May 12, 559–64, 3 figs.

This article recapitulates rather more shortly the author's article on the same subject in *Endeavour* (1944, v. 3, 87). After a clear explanation of the physical and the physiological factors concerned in maintaining the body in heat equilibrium, Professor Brunt goes on to consider the limits of heat stroke conditions. Here he is on less sure ground as, working only from the experimental data of WINSLOW, HERINGTON and GAGGE, by extrapolation he has derived a series of curves to show the limits of the range of tolerable conditions for varying degrees of activity, for nude and clothed men, indoors and in the sun. In his previous paper the author quoted in some detail the data from which he drew his conclusions, reprinting WINSLOW'S diagrams on the heat exchanges and physiological responses at different operative temperatures, but in neither paper does he relate precisely how he got these curves. For nude men resting indoors Dr. Brunt gives limiting environments in a hot dry climate of 113°F. for R.H. nil, or 106°F. for R.H. 20 per cent., when the air movement is 17 ft./min. [Practical experience in a desert climate would have shown the author that this limit is pitched rather low.] In a hot wet climate with the same air movement, 88°F., R.H. 100 per cent., is given as the upper limit above which heat stroke occurs ; Dr. J. S. HALDANE'S observations in coal mines are given as evidence in support of this. At 80 per cent. R.H. the limiting temperature for a nude resting man is calculated by Dr. Brunt to be 93°F. Above this temperature, according to him, the metabolic heat of the body is greater than that which can be lost by evaporation, conduction and convection [again, experience belies this ; in experimental hot rooms nude men can work and recover after work when the R.H. is 80 per cent. and the air temperature is 100°F.].

" Acclimatisation to hot conditions," according to Professor Brunt, " consists largely in training the sweat glands to function efficiently." [This is correct, but an equally important factor is the redistribution of the blood and the training of the circulatory system ; the increase in plasma volume that has been shown to occur during acclimatization is not mentioned.]

On the subject of ventilation the author says " It is easy to compute limits of tolerable conditions, with any selected rate of air motion, for nude subjects." He has made these computations and reproduces a series of curves for limiting tolerable conditions with air movements ranging from 17 ft./min. to 1,000 ft./min. He suggests that an increase in air movement has a far greater cooling effect in a hot dry than in a hot wet atmosphere [actual experiments, some unpublished, some available in the literature, show the reverse to be the case, increasing the air movement in a hot dry climate having relatively little effect in comparison with that which occurs in a hot wet climate]. His computations for a nude resting man in an air movement of 1,000 ft./min. give as comparable conditions 103°F. R.H. 66 per cent. (W.B. 92°F.), 110°F. R.H. 42 per cent. (W.B. 88°F.) and 132°F. R.H. 7 per cent. (W.B. 78°F.) ; from his calculations the sweat to be evaporated per hour under these conditions will need to be 720 gm., 1,150 gm. and 2,370 gm. respectively. These are given as the upper limits for tolerable conditions above which there is heat stroke. [In the light of his own experience the reviewer finds it difficult to accept these figures.]

Professor Brunt rightly draws attention to the loss of solids in the sweat and warns against the cramps that follow severe salt losses. He then says " It is possible for dehydration of the body to cause sweating to stop " [this is doubtful unless the dehydration is so severe as to cause death by itself, in true heat stroke (hyperpyrexia) the sweating stops when there may actually be superhydration]. The danger of high air speeds when the air temperature is above the body temperature is emphasized.

Professor Brunt classifies climates into :—

Intolerable—Heat-stroke.
Very Hot—risk of Heat-stroke.
Warm.
Range of Pleasant Conditions.
Cool.
Cold.

He shows a temperature and humidity chart with zones corresponding to these classifications marked upon it. He has used the same computations as for his other charts. [The lower limits for the intolerable and the very hot zones respectively would both appear to be lower than either field or experimental experience would suggest to physiologists working on this subject.]

The ideal climate is one in which, Professor Brunt says, " It should be possible for a lightly clothed man to walk at four miles per hour in the sunshine without sweating, and to sit in the sunshine, or stand or sit in the shade or indoors doing light work, without shivering. With relative humidity of about 60 per cent., the temperature to fit this prescription will be between 66 and 68°F., and the optimum is thus 67°F." Dr. Brunt then quotes S. F. Markham (*Climate and Energy of Nations*) to the effect that in the ideal country the mean temperature in the hottest month of the year should not exceed 75°F. and the mean temperature in the coldest month of the year should not be below freezing point. " The largest single area satisfying these conditions is that part of western Europe which includes the British Isles, France, northern Spain, Switzerland, Germany, the Netherlands, Denmark,

and a strip along the south-western shores of Scandinavia. Within this area there is a higher level of health and prosperity than in the neighbouring regions."

Finally, after a brief history of the development of a weather-proof house in England, Dr. Brunt concludes that "it may not be a fortuitous coincidence that the glories of Elizabethan England came soon after the advent of the weather-proof house."

In his *Endeavour* paper the author says "The physiological reaction of the body to increasing relative humidity and decreasing air-speed . . . is a reaction which cannot be simulated by any instrument, and it is therefore not possible to devise an instrument which will produce a response exactly parallel to that of the human body." [Equally, too little is known yet of the various interacting factors in the heat regulation for the body's reactions to be predicted by application of physical laws to the result of a few experiments. Professor Brunt's calculations are far from being in accord with published and unpublished experimental evidence but that they come as close as they do shows how much is already known about the physics of body temperature.]

W. S. S. Ladell.

MILLS, C. A. **Metabolic Acclimatization to Tropical Heat.** *Amer. J. Trop. Med.* 1945, Jan., v. 25, No. 1, 59–61. [15 refs.]

The author maintains that acclimatization to tropical heat has two aspects. The first, which is dominant in the first five days of exposure, involves the readjustments in the cardiovascular and vasomotor systems. The second phase is metabolic, and is not established until later. Experiments are quoted in which it was found that rats kept at 90°F. needed, for optimum growth, twice as much dietary thiamin and about six times as much choline as rats kept at 68°F. In rats at 90°F. the rate of growth was directly proportional to the choline content of the diet, whereas at 68°F. it made little difference whether choline was present or not; once the danger period for haemorrhagic nephritis was passed, optimum growth took place on 30 per cent. less food at 90°F. than at 68°F.

It is claimed that these results are not contradicted by human experiments (see KEYS, ANCEL, *et al.*, *Federation Proc.*, 1944, v. 3, 18) in which it has been shown that vitamin supplementation had no effect on performance at high temperatures. These experiments were all short, involving exposure for a few days only, or intermittently in a hot-room.

[From the practical point of view, this is a case in which it is singularly difficult to apply to man results obtained on rats. There is a considerable difference in the method of temperature regulation in the two species; the rat has little scope for varying its rate of heat loss, compared with man, with his evaporative cooling by sweat. The rat probably has to rely more on restricting heat production, and therefore, food intake. This may explain why the vitamin concentration of the food has to be raised. It is not, however, the whole explanation, and the figures quoted show that the absolute requirements for choline and B_t were greater at the higher temperature. These results have not as yet been confirmed by other workers.] *J. Waterlow.*

KLIGLER, I. J., GUGGENHEIM, K. & SCHWARTZ, I. **Adaptation to Changes in Environmental Humidity at Constant Temperatures.** *Proc. Soc. Exper. Biol. & Med.* 1945, Apr., v. 58, No. 4, 286–9.

Two groups of rats were kept at a temperature of 28–30°C.; one group of 26 at a relative humidity (R.H.) of 10–20 per cent., the other group of 19 at R.H. 80–100 per cent. The daily average water intake, urine output and

chloride and nitrogen excretions were measured on each group over one week after a preliminary stabilization period. The excretion was the same in both groups but the water intake of the rats in the humid environment was less than that of the other group. The environments of the two groups were then changed over, so that the first group was now exposed to a high R.H., and the second to a low R.H. The rats switched from low to high R.H. continued to have the same water intake, but there was a statistically significant increase in their urine output, and chloride and nitrogen excretions; on the other hand, rats switched from high to low R.H. showed no change in their rates of excretion, but increased their water intake. In both groups these changes passed off within a week. The authors consider that the changes that occur with the transference from a low to a high R.H. could be explained on the basis of thyroid stimulation, and in support of this hypothesis they report a further experiment on four thyroidectomized rats; when these were transferred from a low to a high R.H. they did not show any of the changes in excretion that the normal animals did.

[This experiment would have been more valuable if some attention had been paid to the body weights of the rats. It is impossible to partition the changes in water losses, and in water intakes between evaporated loss and body water without knowing the changes in body weights. The effect of transferring the rats back to their first environments would have been interesting, but this extension of the experiments was not done. There is no mention of the adrenal cortex.] *W. S. S. Ladell.*

Rose, T. F. **Urinary Colic due to Crystalluria and Calculi in Hot Humid Climates.** *Med. J. Australia.* 1945, June 2, v. 1, No. 22, 558–61.

At an advanced Field Hospital in the tropics, 62 of 1,020 patients admitted for surgical conditions other than wounds or accidental injuries, were suffering from renal or ureteric colic due to crystalluria or calculus; 61 came from temperate climates and had never had urinary symptoms before arriving in the tropics. The series does not include patients with renal complications of sulphonamide therapy. The crystals were usually of calcium oxalate or triple phosphates.

It was found that the patients could be classified into: A, those with a normal urinary tract (38); B, those with radio-translucent ureteric aggregations of crystals (5); C, those with radio-opaque ureteric aggregations of crystals (10); and D, those with true renal or ureteric calculi (9).

For the first few weeks, newcomers to the tropics sweat a great deal and drink much water and so have no tendency to crystalluria; after one to three months, though sweating continues, they drink less and their urine becomes concentrated and crystals are deposited, first in the collecting tubules and the pelvis of the kidney, and later they enter the ureter. During the next six months, small aggregations of crystals are formed but are too small to give a radiographic shadow. The final stage is the formation of calculi.

None of these patients had bacilluria or any other cause of the deposit of salts except concentration of urine.

The conditions in the four classes are described in considerable detail; nine had temporary hydronephrosis or hydroureter, and two had anuria due to bilateral blocking of the ureters.

Treatment of crystalluria consisted chiefly in giving as much fluid to drink as possible; potassium citrate was given if the urine was acid and contained calcium oxalate crystals, and acid sodium phosphate when it was alkaline and contained crystals of triple phosphate. Pain was relieved by intravenous

injection of morphine. Ureteric crystals were treated in the same way, but renal calculi were removed by operation. *J. F. Corson.*

TROPICAL ULCER.

JARVIS, J. F. **Tropical Ulcer.** *East African Med. J.* 1945, May, v. 22, No. 5, 134–44.

This is an account of an address and discussion at the local branch of the British Medical Association. It deals with the subject of tropical ulcer on general lines, the points being illustrated by the personal experience of the author and those who took part. He considers the aetiology, clinical features and the treatment, curative and prophylactic. The aetiology is still obscure and calls for intensive research, for, in the absence of more exact knowledge of the cause, treatment must be, except on general lines, empirical and prophylaxis haphazard. It is observed that these ulcers tend to recur in epidemics, that labourers in one locality may, many of them, suffer, whereas others in apparently the same circumstances have a low incidence, and also that, conditions remaining apparently unchanged, these ulcers may be prevalent at one time, uncommon at another. To ascribe the prevalence to " lack of tissue resistance " is merely throwing the inquiry one stage further back and adds nothing to knowledge.

Clinically, the ulcer exhibits three stages : active spread, arrest, and repair, healing being delayed by indolence due to constitutional disease or unsuitable treatment, or by epithelial exhaustion, a term applied by the author to retardation or cessation of epithelialization. In others the ulcer becomes chronic from strangulation of the blood-supply by a fibrous barrier below the granulations, new skin readily breaking down ; in others the necrotic process may spread deeper to tendon and bone with resultant deformity if not checked in time.

The principles of curative treatment are rest and improvement in diet ; the former being attained by application of plaster of Paris with no niggard hand. Locally, the need for cleaning the site and keeping it clean is duly stressed. Scraping is recommended by some practitioners for indolent ulcers or those which are chronic from fibrosis but the author favours excision—removal of the whole surface, the skin edges and the granulations—followed by application of zipp and plaster. Prophylaxis is on common sense lines, namely, medical examination and selection of labour recruits, early treatment of minor injuries, improvement in diet and, where possible, communal cooking because men " on their own " and away from their women-folk will not bother to get vegetables or to cook their meals properly. Camp supervisors should make frequent inspections to see to these matters. *H. Harold Scott.*

RAO, M. V. R., COLAH, R. B. M. & KALLE, R. A. **" Tropical Ulcer " in East Khandesh. Treatment with Sulphathiazole Cod-Liver Oil Paste.** *Indian Med. Gaz.* 1945, Mar., v. 80, No. 3, 128–30, 4 figs. on 1 pl.

Tropical ulcers were common among poorly nourished people in the East Kandesh district of the northern section of the Deccan tableland, Bombay Presidency ; the authors treated 127 cases by the following method. The ulcer was thoroughly cleaned under general anaesthesia, mopped dry with

gauze, and a fairly thick layer of a "water-in-oil" emulsion containing sulphathiazole and cod-liver oil was applied and covered with a gauze-covered pad of cotton wool impregnated with sulphanilamide.

The "water-in-oil" emulsion was prepared according to the formula used by DIKSHIT and GARDHAM [*Indian Med. Gaz.*, 1945, v. 80, 121]; it consisted of sulphathiazole 12, calcium oleate 2, beeswax 3, cod-liver oil 60, and water 40 parts. This dressing, changed about every three days, was continued until the ulcer showed healthy granulation tissue, and was then replaced by 2 per cent. solution of oxalic acid.

Small ulcers were almost healed within three weeks. General treatment consisted of rest in bed, supply of good food, shark-liver oil, and fresh lime juice. *J. F. Corson.*

MOUSTARDIER, G. & NICOL, R. Notes sur le traitement des ulcères phagédéniques. [**Notes on the Treatment of Phagedaenic Ulcer.**] *Rev. Sci. Méd. Pharm. et Vét. de l'Afrique Française Libre.* 1943, Oct., v. 2, No. 4, 371–6.

In 1930 Moustardier began to try intravenous injections of tartar emetic for patients with phagedaenic ulcer in Indo-China, with good results. Nine years later, at Brazzaville, he tried *nitrosyl*, a vitaminized ointment and again the results proved to be very satisfactory. The authors have been using a combination of these forms of treatment. For adults they inject 1 cc. of 1 per cent. tartar emetic, two days later 3 cc., on the fifth day 5 cc., on the seventh day 10 cc., and thereafter 10 cc. on alternate days till the ulcer clears or cicatrizes, but never exceeding a total of 1·2 gm. As soon as the ulcer is clean, usually after the fourth or fifth injection, they apply locally, every 48 hours, an ointment of cod-liver oil and septoplix [the composition of this is not given] until healing is complete.

In a table the authors give a list of 43 patients treated thus in hospital and eight treated as out-patients. In this table are stated the name, sex and age, the site and size of the ulcers, the amount of tartar emetic injected and the length of time before the ulcer healed. The shortest time was six days; the patient a man of 24 years, with an ulcer 2 × 1 cm. on the left leg; the longest 68 days, a boy of 11 years with an ulcer over the tendo Achillis, 2 × 2 cm.; in another patient, a man of 28 years, an ulcer of 9 × 9 cm. over the same site as the last, healed in 39 days, and in a fourth, a man of 28 years, an ulcer 5 × 4 cm. on the left leg was healed in 10 days. In every case the organisms found were a spirillum and fusiform bacillus. Generally, ulcers about the knees, the ankles or the tendo Achillis were the most refractory. For ulcers more than 8 sq. cm. in size the average dose of tartar emetic required was 0·57 gm., and the time of hospitalization 28 days. Those treated as out-patients responded less favourably in that they needed more injections and longer treatment. Since the mode of treatment was the same, it is thought that the out-patient removes the dressings to look at the ulcers or ascertain progress, or applies village treatment also, or gets the dressings soiled.

H. Harold Scott.

DINIZ, O. Ainda o tratamento de úlceras pelo processo de zeno (18 observações e breves comentários). [**The Treatment of Ulcers by the Zeno Process.**] *Brasil-Medico.* 1945, Apr. 21 & 28, v. 59, Nos. 16 & 17, 129–36, 29 figs.

The method of treatment here referred to is that recommended by Professor Zeno in 1943 for burns. Based on a dictum of Böhler that the best fluid for

regeneration of an infected wound is the wound's own secretion at the body-temperature, Zeno went further and added that the tissues were damaged by the use of antiseptics and that the essential of cure was that it should not be hindered by any movement—in other words, absolute rest and non-interference were the essentials. He, therefore, treats chronic ulceration by plaster dressings, after cleaning the surface, and, to mask the foul smell of these ulcers, he first applies to them layers of gauze impregnated with 12 per cent. lactose. The plaster is left on [it would appear from these notes of cases] for 3–4 months, after which it is removed and cure is nearly complete in most by this time. If not, a second dressing is applied and removed after 4–6 weeks. Pain is relieved early. The author gives brief notes of fifteen patients with chronic ulcers; three of them had two ulcers and in one the ulcer had persisted for over 20 years.

Photographs are reproduced showing the conditions before and after treatment. Of the 18 ulcers so treated, eight were completely healed, five almost healed, four had improved and in one only was the lesion found to be worse and extending when the plaster was removed. This was a man of 22 years who had suffered from the ulcer for seven years. The plaster was applied in his case on January 18th, 1944, and removed on March 9th. No reason is offered for the failure in this instance. *H. Harold Scott.*

WARD, R. L. & MASON, A. S. **Polyneuritis after Jungle Sores. A Series of Twenty-One Cases.** *Brit. Med. J.* 1945, Aug. 25, 252–4.

Many British and Indian soldiers developed multiple indolent ulcers, known as " jungle sores " during the recent campaign in Burma, and several British, but no Indian, soldiers afterwards suffered from peripheral neuritis. Among 21 patients in hospital with peripheral neuritis, 11 were admitted for neuritic symptoms, nine for malarial relapses, and one for jungle sores; all had suffered from jungle sores; the number of ulcers, now healed, varying from 2 to 40 per man with an average of 14. The commonest sites were the lower leg and forearm. The sores had taken from 4 to 17 weeks to heal, the average time being eight weeks.

The typical jungle sore was a circular or oval punched-out ulcer, about ¾ inch in diameter, with a necrotic sloughing base and unhealthy purple edges.

In 16 cases the first symptom of nervous involvement was blurring of vision, usually noticed after reading a few pages of print; it began from 4 to 12 weeks after the jungle sore appeared and lasted for about four weeks, after which vision became normal. All the patients had sensory symptoms—tingling, numbness and coldness of the extremities, and some also complained of difficulty in writing and walking. Astereognosis and ataxia also occurred.

Neurological examination showed the following conditions:—Paresis of the lower neurone type, greatest in the hands and feet, spreading peripherally, but recovery took place in the reverse direction; the extensor muscles were more affected than the flexors. Its distribution did not correspond with that of the jungle sores. All forms of impaired sensation, including postural sense, occurred and corresponded to the paresis.

The muscles were not wasted and were rarely tender; tendon reflexes were absent in the affected limbs. Paralysis of accommodation was a marked feature of the disease, but in the few cases in which blurring of vision occurred in the hospital, the pupils reacted to both light and accommodation. Apart from these signs the general bodily state of the patients was good. Details are given of three cases.

The authors discuss the differential diagnosis and conclude that the polyneuritis was due to infection of the jungle sores with diphtheria bacilli; these

were isolated from the sores of the one patient in hospital who had unhealed sores and a week later he developed diphtheria of the throat. The origin of the diphtheritic infection in these cases remains obscure. [The veldt sore of South Africa was found as long ago as 1901 similarly to be associated with the diphtheria bacillus.] *J. F. Corson.*

War Medicine. Chicago. 1945, June, v. 7, No. 6, 385–9. **Cutaneous Diphtheria.** War Department Technical Bulletin. TB Med 143.

MISCELLANEOUS DISEASES.

Bhattacharjya, B. P. **Tropical Pyomyositis (Bung-Pagga's Disease).** *Indian Med. Gaz.* 1945, Mar., v. 80, No. 3, 139–40.

Three cases of tropical myositis [intramuscular abscess] in soldiers (race not stated) were treated at the Combined Military Hospital at Roorkee, India. Sulphathiazole was given with little or no effect; some of the abscesses were incised and others subsided spontaneously. ["Bungpagga" was a tribal name for the disease in the Northern Territories of the Gold Coast, see this *Bulletin*, 1917, v. 9, 53.] *J. F. Corson.*

Falcão, P. C. Contribuição ao estudo do rinoscleroma no Brasil. [**Rhinoscleroma in Brazil.**] *Brasil-Medico.* 1945, Apr. 21 & 28, v. 59, Nos. 16 & 17, 136–44, 9 figs. [31 refs.]

Among 16,000 cases observed in 1940 by the author there was only one of rhinoscleroma, a Brazilian white man of 23 years of age. In 1940 he applied for treatment "complaining of the nose and throat." The symptoms had begun three years before with attacks of dysphonia at times associated with dyspnoea. Then he began to feel increasing obstruction in the nostrils and they finally became blocked.

Examination revealed polypoid formations, sessile or with short pedicles, in both nostrils, and others below the larynx extending into the trachea, some with removable crusts. There was no enlargement of the cervical glands. Microscopically, fragments of tissue removed showed the characteristics of rhinoscleroma. Frisch's bacillus was seen and cultivated. The morphological and cultural characters of this organism, named *B. rhinoscleromatis* by Frisch in 1882, are described.

The author states that cases of this disease are rare in Brazil which cannot, therefore, be regarded as an endemic focus. Only 26 cases have been recorded in the country since 1890, when Lutz reported the first recognized case. Of the total, 16 only were autochthonous, six were Europeans, one an African, in three the nationality is not stated; 11 were males, 11 females, in four the sex is not mentioned; 11 were whites, 12 were coloured, three not specified. The author does not think the paucity of cases is due to failure to diagnose them, but to the actual rarity of the condition. *H. Harold Scott.*

i. Laha, P. N. **Bengal Splenomegaly. With an Illustrative Case Report.** *J. Indian Med. Ass.* 1945, June, v. 14, No. 9, 199–200.
ii. J. Indian Med. Ass. 1945, June, v. 14, No. 9, 201–2. [10 refs.] **Bengal Splenomegaly.**

i. The patient was a Muslim male, 25 years of age, giving a history of irregular fever for six months. On coming to hospital he was pale and emaciated, with a temperature of 99°F., pulse 82, respirations 26 per minute, spleen felt 3 inches below the costal margin and hard, liver enlarged to 1 inch below. Red corpuscles totalled 1,290,000, white 5,400 per cmm., haemoglobin 5·5 gm. per cent.; polymorphonuclears 74, lymphocytes 20, monocytes 6 per cent.; no parasites seen. Fragility: haemolysis begins in 0·42 per cent. saline and is complete in 0·3 per cent.; platelets 180,000 per cmm., bleeding time 4 minutes 50 seconds, coagulation time 7 min. 50 secs. Van den Bergh indirect positive. Nothing abnormal seen in stools or urine; Wassermann reaction negative, nothing abnormal from spleen puncture.

The anaemia and general health improved with parenteral liver therapy, r.b.c. 2,100,000, white 4,150 per cmm. (polymorphonuclears 48, lymphocytes 48, monocytes and eosinophiles each 2 per cent.), haemoglobin 7 gm., but there was no change in the size of the spleen or liver.

Such was the clinical condition, typical in nearly every respect of what has been previously reported as Bengal splenomegaly [see this *Bulletin*, 1933, v. 30, 43; 1940, v. 37, 232; 1944, v. 41, 144]. In Sen Gupta's cases [the last of these references] the anaemia was orthochromic and macrocytic, whereas in the case here reported it was hyperchromic.

ii. In a leading article previous reports are debated and the aetiology discussed in an able manner, but no conclusion is reached. Sen Gupta's suggestion that it is basically due to hypersensitiveness to malaria infection leading to intense hyperplasia of reticulo-endothelial tissue and splenic enlargement, itself leads to the question: Why does not the spleen show histologically some specific sign of malarial infestation? The editorial states: "It is not irrational to conclude that Banti's disease and Bengal splenomegaly are not possibly one and the same clinical entity.' [This is not very clear; does the third negative enforce or contradict the first two?] *H. Harold Scott.*

Chabeuf, M. Notes sur le cancer chez les indigènes du Sud-Cameroun. [**Cancer among Natives of South Cameroons.**] *Rev. Sci. Méd. Pharm. et Vét. de l'Afrique Française Libre.* 1943, Oct., v. 2, No. 4, 377–406, 2 pls. [29 refs.]

This paper is divided into two main parts; in the first the author, after quoting the records of others on the subject of malignant tumours in tropical countries, gives notes on 20 patients with new growths seen during five years from August 1937 to October 1942. Among these, six were melano-sarcoma, eight were other forms of sarcoma (one of the ovary in a child of 12 years), four were primary epithelioma of the liver, one a secondary epithelioma of liver, and one an adenoma of the testicle. Eleven of the 20 were males and the average age of these was 35 years; among the nine females the average age was 38 years. Thirteen of the 20 have died, three are still living (three years after the first observations), four have been lost sight of. The preponderance, if one can speak of preponderance among so small a total of cases, of malignant melanomas among females is noteworthy; only one was in a man. All those with cancer of the liver were men.

The second part of the article deals in a general discussion on cutaneous malignant melanomas and on primary epithelioma of the liver and is made up

of quotations from the literature on these subjects with passing comments, but does not contribute anything fresh. *H. Harold Scott.*

EVANS, H. M. **Toxic Properties of Sting-ray's Sting.** [Correspondence.] *Brit. Med. J.* 1945, Aug. 4, 165.

[Stingarees or sting-rays are rare in the coastal waters of Britain, but are fairly common abroad. *Trygon pastinaea* is met with in Japanese waters, *Aëtobatis narinari*, the " Bishop's ray," *Trygon sephen* and others in the Indian ocean. The sting-ray has a long, flexible, whip-like tail, ending in a bony spine with sharp cutting teeth and a sharp point. When the ray attacks he strikes the tail round the victim's limb or body and forces the spine in causing a deep lacerated wound.]

The author describes the symptoms in a case occuring in India and reported to him. The fish caused a stab-incision on the right foot. There were signs of bruising but little or no haemorrhage. Local pain was severe at first, with numbness of the limb. In 45 minutes respiration was painful and became increasingly so ; in 1½ hours spasm of the abdominal muscles set in, with restlessness, nausea, dizziness and tingling of the extremities. The pain became more and more severe ; morphia was needed and had to be repeated. Vomiting ensued. The pain on breathing and the muscular spasms continued for three days ; constipation was troublesome. The wound ulcerated and did not heal for a fortnight.

The author gives also an account of the symptoms in a case of jellyfish sting ; these were closely similar to those of the sting-ray, especially the abdominal spasm and the obstinate constipation. From this it is argued that the venoms of both are of the same nature [a point too important to take for granted and calling for further proof]. As Madame PHISALIX has shown, there are two toxic principles in the jelly-fish toxin—congestin and thalassin. *H. Harold Scott.*

FLECKER, H. **Injuries produced by Plants in Tropical Queensland.** *Med. J. Australia.* 1945, June 23, v. 1, No. 25, 636–7.

GENERAL PROTOZOOLOGY.

ALLI, J. H. **Tannic Acid Fixative Method for Staining Protozoa.** *Milit. Surgeon.* 1944, Oct. v. 95, No. 4, 317–19. [10 refs.]

In this method the author fixes faecal smears on cover glasses in the following mixture for 5 to 7 minutes :—tannic acid 4 gm., 70 per cent. ethyl alcohol 90 cc., glacial acetic acid 5 cc., phenol crystals 1 gm. After fixation and washing in tap water, mordanting is effected in 4 per cent. ferric ammonium sulphate for 1 to 3 minutes. The films are well washed in tap water, and are stained with ripened 0·5 per cent. iron-haematoxylin, or a solution of haematin crystals, for 3 to 5 minutes. After washing, the films are differentiated in 1 per cent. hydrochloric acid in 70 per cent. alcohol till the blueness has not quite disappeared. The films are then washed well in tap water, taken through the alcohols, cleared and mounted in Canada balsam. It is stated that in films stained by the above method the protozoa are well fixed and stained and ready for examination within half an hour. *C. M. Wenyon.*

STABLER, R. M. **Ingestion Processes on *Iodamoeba* (Protozoa).** *J. Parasitology.* 1945, Feb., v. 31, No. 1, 79–80, 8 figs on 1 pl.

In a study of *Iodamoeba bütschlii* from two cases of human infection the author noted that a varying proportion of the amoebae (11·7 per cent. in one case and 27·0 per cent. in the other) were provided with one to four tube-like processes which appeared to be concerned with the ingestion of food. Some were quite large, up to 15μ in length and 6μ in breadth, others were shorter and narrower. Many of them were twisted, while some for at least part of their length were tubular. Food particles such as bacteria were seen to be ingested at the open extremities. It seemed that after persisting for some time the tube-like structures were subject to withdrawal, during which their margins stained more intensely. Examination of *Iodamoeba kueneni* from the chimpanzee and the Guinea baboon showed that this species formed similar projections, which are like those described by WENRICH [see this *Bulletin*, 1945, v. 42, 386] in *Entamoeba muris*, *E. ranarum*, *Dientamoeba fragilis* and *Histomonas meleagridis*. The paper is illustrated by eight figures showing the character of the processes. *C. M. Wenyon.*

TOMLINSON, W. J. **Human Chronic Toxoplasmosis.** *Amer. J. Clin. Path.*, 1945, Apr., v. 15, 123. [Summary taken from *J. Amer. Med. Ass.* 1945. July 28, v. 128, No. 13, 975.]

The literature reveals that 13 cases of toxoplasma infection have been diagnosed at necropsy and three clinical cases have been diagnosed by recovery of the parasites from cerebrospinal fluid. Weinman, in a study of immunity in experimental toxoplasmosis, found that chronic toxoplasmosis in animals produced a different picture from the acute disease. Human chronic toxoplasmosis has not been demonstrated. While reviewing the necropsy material on sickle cell anemia, Tomlinson found an instance of chronic toxoplasmosis in a British West Indian Negro girl aged 10 years 8 months, who died of sickle cell anemia in the Canal Zone and who had no symptoms referable to toxoplasma infection. The case therefore represents the first reported case of chronic, asymptomatic human toxoplasmosis. Toxoplasma parasites were found in pseudocysts throughout the brain and in aggregates within myocardial fibers. They were not accompanied by inflammatory changes or necrosis.

GENERAL ENTOMOLOGY.

LEVER, R. J. A. W. **Entomological Notes.** *Agric. J. Fiji.* Suva. 1944, v. 15, No. 2, 45–50. [17 refs.] [Summary taken from *Rev. Applied Entom.* Ser. B. 1945, July, v. 33, Pt. 7, 104.]

Notes are given on the breeding places of various mosquitos that occur in Fiji. *Aëdes scutellaris pseudoscutellaris*, Theo., was found breeding in February 1944 in leaf axils of *Alpinia* and more recently in fallen, broken shells of the introduced calabash (*Crescentia cujete*). In one case, there was no water in the shell, but only a mass of damp leaf-mould in which the larvae pupated. Also, larvae of *A. scutellaris horrescens*, Edw., which is confined to the Fiji Islands, were found in a hole in a tree (*Barringtonia speciosa*) containing only damp leaf-mould. *Culex fatigans*, Wied., and *A. aegypti*, L., breed in large

numbers in diluted fowl manure if this is left about in tins. Recent research by Army medical units has indicated that *A. scutellaris pseudoscutellaris* may be a vector of dengue in New Guinea, and this seems to be the case in Fiji also, since it was more abundant than *A. aegypti* from August to October in certain parts of Suva and early in December at the height of the epidemic at Nadi. In experiments in April and May 1944 on the suitability of different kinds of dung for *Musca domestica vicina*, Macq., the percentages of the larvae that pupated were 36 in pig dung and 64 in cow dung. Horses in the Suva Peninsula, where the work was done, are too rare to be a serious source of flies in the town area.

GINSBURG, J. M. **Mosquito Oils, Larvicides, Repellents, Outdoor Sprays and their Application.** *Bull. New Jersey Agric. Exper. Station No. 711.* New Brunswick. 1944, Apr., 12 pp., 2 figs. [16 refs.]

The problem of mosquito control varies greatly with the habits and type of breeding place to be attacked. In all cases permanent measures are preferable, but where they are impracticable or impossible, temporary measures must be used, and, if necessary, personal prophylactic measures also taken. Petroleum oil distillates are the best chemical larvicides developed; the requirements of a good specimen are quick toxicity to larvae and pupae, good spreading on all kinds of waters, rapid penetration through débris and vegetation, a stable and long-lasting film, inoffensive odour to man, absence of injurious effect on fish, waterfowl and plant life, and low cost.

Oils of low boiling range kill by immediate toxic effect after inspiration into the tracheal tubes, while high boiling fractions kill by suffocation after the tracheal system has been blocked. Experiments with different types of oil show that a good specimen should contain sufficient low boiling fractions (up to 600°F.) to ensure a rapid kill, and sufficient high boiling fractions to leave a lasting film. A combination of this type can be obtained in New Jersey at a cost of from 5·5 to 8 cents a gallon, of which 10 per cent. distils at 430°–450°F. 50 per cent. at 510°–555°F., and 90 per cent. at 630°F. or higher; it has a gravity (A.P.I) of 27–33, a flash point of 130°F. or higher, and a viscosity of 35–40.

It has been found that application to the sides of a breeding place prolongs the toxic action, by continuous downward seepage. When difficulty is met with in forming a continuous film, it may be overcome either by power spraying or by the addition of a spread aider to the oil, either 0·5 per cent. crude cresylic acid or 3 per cent. of a tar oil containing 25 per cent. cresylic acid. The quantity of oil required varies from 25 to 60 gallons per acre.

In places, such as ornamental pools, where oil is not suitable, various other substances may be used. The best is said to be an emulsion of an oil solution of pyrethrum, which, in the dilute form finally applied, contains 0·007 per cent. pyrethrins. Though cheaper in larvicidal costs than oil, the more frequent application needed increases the final cost when this larvicide is used. Soap, phenol and paris green also have their applications, but the latter is not much used for general mosquito control on account of its specificity for anopheline larvae. The author favours power sprayers for the application of larvicide wherever possible.

Protection against adult mosquitoes may be secured by the individual use of repellents, such as dimethyl phthallate, or large groups may be protected by applying the pyrethrum oil water emulsion to the ground in places where open air meetings are to be held, followed by spraying it into the atmosphere in the form of a fog on the windward side both before and during the meeting.

G. Macdonald.

Gordon, W. M. & Gerberg, E. J. **A Directional Mosquito Barrier Trap.** *J. National Malaria Soc.* Tallahassee, Fla. 1945, June, v. 4, No. 2, 123–5, 1 fig.

de Meillon, B., Parent, M. & Black, L. O'C. **Descriptions of New Larvae and Pupae of Ethiopian Culicini.** *Bull. Entom. Res.* 1945, July, v. 36, Pt. 1, 85–101, 5 figs.

Jukova, N. N. [**Employment of "K"-preparation for Sandfly Control.**] *Med. Parasit. & Parasitic Dis.* Moscow. 1944, v. 13, No. 5, 93. [In Russian.]

The author describes the results of tests with "bisethylxanthogen" [=xanthic disulphide], known as "K preparation," which was used as a repellent against sandflies. It was shown that sandflies are effectively repelled for 7–9 days and prevented from entering rooms through the open windows, after the walls, ceiling and doors of a room had been sprayed with 0·5–1 per cent. water emulsion of the preparation, with soap as the emulsifying agent, the consumption being 200–400 cc. of the fluid per 1 cub. metre. Further experiments revealed that the same effect can be produced by spraying a single sheet and hanging it on the wall near the bed. Protection for persons exposed to the bites of sandflies, such as night-watchmen, is afforded, on the one hand, by impregnating the underwear with a 1 per cent. emulsion of the preparation, and, on the other, by smearing the unprotected parts of the body with a vaseline ointment containing 3–5 per cent. of "bisethylxanthogen" and renewing it every 2–3 days. *C. A. Hoare.*

Vargas, L. Nota sobre ceratopogónidos y Culicoides. [**Notes on the Ceratopogonidae and** *Culicoides.*] *Rev. Inst. Salubridad y Enfermedades Trop.* Mexico. 1945, Mar., v. 6, No. 1, 41–9, 3 figs. [28 refs.] English summary.

"The author presents a condensed revision of the supposed or already demonstrated rôle as vectors of diseases, assigned to Ceratopogonidae. He also gives a preliminary list of the species of the western hemisphere recording 14 species for Mexico, of which three are new for the country. He includes drawings of the wings of *copiosus*, *piliferus* and male terminalia of *cockerelli* var. *tristriatulus*."

Hill, M. A. & Gordon, R. M. **An Outbreak of Dermatitis amongst Troops in North Wales caused by Rodent Mites.** *Ann. Trop. Med. & Parasit.* 1945, May 31, v. 39, No. 1, 46–52. [21 refs.]

An outbreak of dermatitis consisting of some sixty cases occurred among American troops stationed in North Wales, following the refilling of mattresses with new straw. The rash consisted of itching and elevated papules 3–10 mm. in diameter surrounded by varying degrees of urticarial reaction. The epidemic ceased immediately the palliasses were subjected to steam disinfestation and the same result followed the substitution of straw from another locality. The straw used to stuff the palliasses, when examined in the store of the affected unit, was found to contain rodent mites belonging to the species *Haemogamasus oudemansi*, *Hypoaspis fenilis*, *Eulaelaps stabularis*, *Poecilochirus spinipes* and

Cheyletus eruditus. Only the first two were identified in the bedding and palliasses of the affected men, *H. fenilis* being present in large numbers. It is considered that some or all of these rodent mites were responsible for the dermatitis. *V. B. Wigglesworth.*

Hurst, H. **Enzyme Activity as a Factor in Insect Physiology and Toxicology.** *Nature.* 1945, Aug. 18, 194–8. [13 refs.]

LABORATORY PROCEDURES.

Dammin, G. J. & Weller, T. H. **Heterophile Agglutinins and Cold Autohemagglutinins in Schistosomiasis, Filariasis, Malaria, and Leprosy.** *Amer. J. Trop. Med.* 1945, Mar., v. 25, No. 2, 97–102, 1 fig. [19 refs.]

At the Antilles Department Medical Laboratory, Porto Rico, the authors tested the Kahn-positive blood sera of 273 soldiers for the presence of heterophile agglutinins and cold autohaemagglutinins; 199 were Porto Rican troops and 74 were United States soldiers stationed in Porto Rico. They had various infections; 104 sera were from patients with rectal schistosomiasis, 104 from cases of filariasis (*Wuchereria bancrofti*), 40 from cases of malaria, and 18 from lepers. The results are shown in tables and are summarized by the authors as follows:—

"In schistosomiasis, 4·9 per cent. had heterophile agglutinin titers over 1 : 32, in filariasis 13 per cent. had titers above 1 : 32, and of the malaria cases 5 per cent. had titers above 1 : 32; in no case was the titer higher than 1 : 128. In the small group of blood specimens from lepers, four showed a heterophile agglutinin titer of 1 : 128. Of twelve quinine-treated malaria cases, nine had a titer of 1 : 32 or lower, and three, a titer of 1 : 64.

"Of the above group of 285 blood specimens, cold autohaemagglutinins in a titer of 1 : 10 or higher could not be demonstrated in 279 or 97 per cent. The few positive specimens showed no particular distribution and the highest titer noted was 1 : 80." *J. F. Corson.*

REPORTS, SURVEYS AND MISCELLANEOUS PAPERS.

Morris, J. N. **Health of Four Hundred Millions.** *Lancet.* 1945, June 16, 743–8, 8 figs. [55 refs.]

In a fully documented article the author has painted a gloomy and depressing, but unhappily a true, picture of conditions of life in India.

The infant-mortality rate in 1912–15 was 204 per mille, and although by 1938–42 the rate had fallen to "over 160" it was more than three times as high as that of England and Wales for the same period. The death rate among Indian children between the ages of 1–5 years in 1938 was eight times as high as that of children in Britain. The expectation of life at birth in India was less than half the corresponding figure for England and other progressive western countries.

Whether the author looks at the state of nutrition of the people of India, their housing conditions, or the prevalence of infectious diseases he receives the same dismal impression. All these, and other aspects of Indian life, are discussed in the article.

By far the most important point in the paper is a brief sentence contained in the section headed " Reconstruction " ; this is—" At the base of this whole problem lies the population crisis, and although this has been ventilated recently it has not yet received the attention and study it urgently demands."

[The author is undoubtedly right in regarding pressure of population as the basic problem of India ; it is also the most important of all the public-health problems affecting the lives of more than half the people of the whole world. The conditions of life in China, North Africa, and many other countries of the world are very similar to those prevailing in India. The astonishing thing is that, practically speaking, the existence of the problem has been ignored in the affected countries, not only by public health workers, but also by administrators, social reformers, economists, and leaders of opinion. The principles involved are of elementary simplicity ; one is that when the available food is inadequate for the number of people who have to be fed, malnutrition and misery are inevitable, the other is that so long as the people of a crowded country refuse to apply checks to the natural rate of reproduction, success in controlling infectious diseases will be followed by a great acceleration of the rate of growth of the population so that the check imposed by epidemics will be replaced by the check caused by malnutrition. The nature of the problem and the action needed for its solution are obvious, but how to persuade the people of the affected countries to take the necessary steps is a matter of the utmost difficulty and complexity.

[The implication contained in the words " ventilated recently " is hardly fair to those alarmists, including the reviewer, who for the past 25 years have been emphasizing the existence of a state of emergency in India and making urgent appeals for a thorough investigation on the broadest lines of this very problem. Within the past two years there have been indications that the Indian administration, following the lead of the present Viceroy, are realizing the gravity of the situation, and it is to be hoped that all public-health workers in India will play their part in tackling this thorny problem, because on its solution depends the success of all their efforts to improve the health of the people.] *John W. D. Megaw.*

Pai, M. N. **India.** [Correspondence.] *Lancet.* 1945, June 23, 800–801.

This frank letter was written as a supplement to the above article. The author gives some of the reasons for the slowness of the progress of scientific medicine in India ; he tells that when Indian Ministers were appointed in various provinces some years ago several of them proceeded to spend public funds for the promotion of " Indian medicine " by opening medical schools and dispensaries in which the ancient systems of medicine are taught and practised. These systems are the Ayurvedic for Hindus and the Arabic [called Unani—a corruption of the word Ionian] for Moslems. A striking example is given of the methods adopted without protest by leading practitioners of these systems ; this is an advertisement in a well-known nationalist newspaper in which the medical man describes himself as " M.A., Late Principal of . . . Ayurveda College, formerly professor of chemistry . . . College " and announces that " he has got very efficient medicine (of Ayurveda, from Sadhus and those of his own researches on Himalayan herbs aided by spiritual power) for cancer, T.B., insanity, hysteria, epilepsy, blood pressure, etc."

Another claims to be the manufacturer of a jewel which "heals incurable diseases, saves from accidents, premature death, fire and theft, ensures success in examinations, complicated lawsuits, and in overcoming enemies." This practitioner's claims are supported by testimonials from maharajahs, members of the Viceroy's Council, ex-premiers of provinces, Indian High-Court Judges, and Indian members of the Privy Council.

The demands of politicians for Indianization and communal representation are said to have resulted in the appointment of some teachers with mediocre qualifications in the 37 institutions in which scientific medicine is taught.

The reason for the encouragement of obsolete systems of medicine is said to be the deep-seated belief of Indians in the wisdom of their ancestors. The educated Indian is described as having a dual personality ; in one capacity he talks and thinks in English, in his home he "resumes the ways of his ancestors."

[These statements, of course, do not apply to all educated Indians, many of whom, like the author himself, are fully as enlightened as their western brothers, but there is plenty of evidence to show that the "magical thinking" mentioned by the writer of the letter is indulged in to an astonishing degree by many of the leaders of public opinion in India.] *John W. D. Megaw.*

GELFAND, M. **Geophagy and its relation to Hookworm Disease.** *East African Med. J.* 1945, Apr., v. 22, No. 4, 98–103.

Geophagy is practised in many parts of Africa, east, west and north, in the Congo, Nyasaland, Northern and Southern Rhodesia. It often coexists with ankylostomiasis and aetiological connexion between them has for this reason been assumed. The author has studied and made inquiries into the subject, and questioning 50 sufferers from hookworm infestation and 50 not so infested has revealed that of the former 14 confessed to the habit at the time or in the past, whereas of the latter 17 did so at present and another nine confessed to having done so in childhood, that is the number practising the habit was greater among the uninfested.

Nothing is certain as to the cause, but several suggestions have been advanced ; probably there is no single cause. Some think that the earth supplies some deficiency, such as calcium, iron or magnesium ; others that it is alkaline and acts as a stomachic or digestive ; others again that it connotes a religious or magical aspect. There is a good deal of evidence in favour of this last, as an act of homage to alien soil by a newcomer, or to impart fertility to a woman by taking to herself the earth's fertility. In short, the connexion between ankylostomiasis and geophagy is probably purely incidental. [An interesting paper.] *H. Harold Scott.*

FRENCH, M. H. **Geophagia in Animals.** *East African Med. J.* 1945, Apr. & May, v. 22, Nos. 4 & 5, 103–10 ; 152–61. [47 refs.]

GUPTA, J. C. & GANGULY, S. C. **The Effect of Quinine and Stilbamidine (M & B 744) on the Reticulo-Endothelial System as measured by the Congo-Red Index.** *Indian Med. Gaz.* 1944, Mar., v. 79, No. 3, 104–7, 2 charts. [15 refs.]

In the Congo Red test, a colloidal dye is injected intravenously and the concentration of the dye in the blood is measured. After an appropriate interval

the concentration in the blood is measured again. The amount of dye which has disappeared from the blood is presumed to have been taken up by the reticulo-endothelial system. The ratio between the dye concentrations on the two occasions is called the Congo Red index and it is considered to be an indication of one aspect of the activity of the reticulo-endothelial system. In the present work 2 cc. of a 1 per cent. solution of the dye was injected intravenously, and blood samples were taken after four and 60 minutes. Judged by this criterion, daily intramuscular injections of quinine (two monkeys) slightly increased the activity of the reticulo-endothelial system, daily intravenous injections of diamidino stilbene (one monkey) diminished it, and so did infection with *Plasmodium knowlesi*, the infection being partially controlled by quinine (three monkeys). *F. Hawking.*

BOOK REVIEWS.

Mair, L. P. **Welfare in the British Colonies.** 115 pp. 1944. London: Royal Institute of International Affairs. [5*s.*]

The essentials of a programme of colonial welfare are education, the control of labour and labouring conditions, the promotion of health, and a social welfare scheme which attends to other aspects of a community's well-being. The background on which they have developed, their history, their place in the administrative machinery of government, and the present trends in their development are described in Dr. Mair's book, one of several published by the Royal Institute of International Affairs with the object of encouraging and facilitating the scientific study of international affairs.

All of these subjects have developed greatly during the last twenty years, with accelerating speed as a result of a progressive Colonial Office policy. Education has developed from the efforts of scattered missionary schools to organized programmes aiming ultimately at universal instruction, but meantime trying to make as much headway as possible under difficult conditions, and showing a definite trend towards mass education, or the simultaneous training of persons of all ages in restricted localities in both literary, technical and domestic subjects, and towards practical teaching of husbandry and domestic arts, though facilities for higher education up to University standards are steadily increasing.

The control of labour and working conditions is in most colonies a very recently accepted responsibility, though Malaya started a Labour Department as long ago as 1911. In recent years the biggest problems have been encountered in connexion with mining and plantation industries in East and West Africa, as they attract large numbers of migrant labourers who need protection in making preliminary contracts, or in moving in search of work often over very long distances, as well as when actually working. Considerable improvement has been achieved during a few years, but standards are not always acceptable and continued effort is needed if good living conditions are to be assured.

The health of sixty million people of the Colonial Empire cannot be adequately cared for by the small numbers of doctors now available, the European doctors employed by the Colonial Government totalling only 700. In future the majority of the staff, both medically qualified and subordinate, must be of the

country in which they work, and ample facilities for training must be available in every Colonial area. Medical education to a standard approved by the General Medical Council can be obtained in Ceylon, Hong Kong, Fiji, East and West Africa and the Sudan, but increased opportunities are urgently needed for the training of " medical aids," dressers, dispensers, nurses, and technical assistants, if medical attention is to be widely available. An outline is given of the measures taken to lessen the main tropical diseases, and of the means by which simple treatment and sanitary instruction are taken to rural areas, though it is clear that these are yet in their infancy.

The term " social welfare " covers an ill-defined group of services with the general object of co-ordinating public and private efforts to encourage desirable changes in social institutions and habits, and alleviate distress. Most progress has been made in the West Indies as a result of the recommendations of the West India Royal Commission, but a start has been made in other places, a notable example being the Rural Welfare Service in Ceylon.

[This publication gives an eminently readable account of general trends of policy in welfare matters, which would be of great help to the early student in becoming acquainted with the problems described for the first time. In the opinion of the reviewer it would succeed better in its object of facilitating the scientific study of colonial problems if it were more factual, and gave fuller evidence of the gaps in the work done, or critical comment on them.]

G. Macdonald.

BISPHAM, William N. [Colonel, U.S. Army, retd.]. **Malaria : its Diagnosis, Treatment and Prophylaxis.** pp. viii+197, frontispiece & 4 pls. (3 coloured). 1944. Baltimore : The Williams & Wilkins Co. : London : Baillière, Tindall & Cox, 7 & 8, Henrietta Street. [$3·50 ; 19*s.* 6*d.*]

This book was written " to give the physician a knowledge of the clinical features of malaria." Its scope is not, however, limited to the clinical features of the disease. The chapter headings are : History ; Geographic Distribution ; Etiology ; The Mosquito ; Epidemiology ; Symptomatology ; Complications ; Diagnosis ; Pathology ; Treatment ; Prevention ; Malarial Immunity ; Animal Experimentation ; Therapeutic Use ; Blackwater Fever ; Prognosis. A final chapter contributed by L. T. GOGGESHALL contains a brief description of the prevention and treatment of malaria in West Africa, and is based largely on his experience while establishing the medical services for an air route from Bathurst, Lagos, Khartoum to Cairo.

Before publication, various sections of the book were reviewed by one or other of twelve outstanding American malariologists and their comments have been embodied in the text. This procedure should make the book authoritative, but the result has not been altogether happy. Interpolations appear at times to be misplaced and there is a certain amount of unnecessary repetition.

The phraseology is sometimes loose and there are sentences that convey very little meaning. The chapter on symptomatology (p. 59) opens thus: " With most physicians the symptoms of malaria are confined to the paroxysm and periodic fever. This is a mistaken idea, for the paroxysms are decidedly different for each type of fever, and there are many other symptoms which should be considered." Further on in that chapter we read (p. 70) " When the attack becomes pernicious, the invasion of the peripheral blood becomes marked, and the number of parasites observed gives an impression that most of the red corpuscules are invaded. This is not always the case, and in some cases the amount of the invasion cannot be determined except by splenic puncture."

On p. 132 occurs the statement " In subtertian malaria coma is frequently a very dangerous symptom, and it should be relieved as soon as possible.

Intravenous injection of 3 cc. of a 40 per cent. solution of urotropin frequently clears up this condition promptly." This advice, divorced from any other remarks about the treatment of cerebral malaria, might be disastrous.

Misprints are not absent. On p. 36, in describing Coggeshall's method of keeping parasites alive in infected blood, it is stated " The cabinet mentioned above is kept cold by solid dry CO_2, maintaining a temperature between 72° and 80°C."

The author's preference for intravenous, as opposed to intramuscular, injections of atabrine, will not receive general approval (p. 124). Dr. Coggeshall (p. 182) is of the opinion that atabrine should not be given intravenously ; this seems to be the accepted view.

Careful revision might make this a very useful manual. As it is, it is not a very trustworthy guide for the physician with limited knowledge and no practical experience of malaria. He might find it somewhat confusing.

Norman White.

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